PHASE 2

Washington State
School Seismic Safety Assessments Project

MARYSVILLE-PILCHUCK HIGH SCHOOL LIBRARY (BUILDING J)

Marysville School District 25

SEISMIC UPGRADES CONCEPT DESIGN REPORT

June 2021

PREPARED FOR

PREPARED BY

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WASHINGTON STATE SCHOOL SEISMIC SAFETY ASSESSMENTS PROJECT

SEISMIC UPGRADES CONCEPT DESIGN REPORT
Marysville-Pilchuck High School – Library (Bldg J)
Marysville School District 25

June 2021

Prepared for:

State of Washington
Department of Natural Resources and Office of Superintendent of Public Instruction

Prepared by:

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EXECUTIVE SUMMARY

This report documents the findings of a seismic evaluation of the Marysville-Pilchuck High School Library Building (Building J) in Marysville, Washington. This school building is a single-story, 20,000-square-foot, stack-bond concrete masonry structure with a wood-framed roof. The building was constructed in 1970. The building features a large-volume library space with 16- to 28-foot-tall exterior masonry walls and a vaulted roof consisting of glulam arches and girders that clear span 110 feet by 110 feet to the exterior walls. The library area is surrounded at the west and east corners by classroom, storage, and office space with a lower flat roof. The areas around the library also have exterior stack bond concrete masonry walls and a wood-framed roof. The roof framing system is layered and consists of wood sheathing supported by 2x3 flat stripping spanning over 2x joists that are supported by glulam girders. The lateral system consists of plywood roof diaphragms and concrete masonry unit (CMU) shear walls on conventional spread footings. The construction of this building, in particular the layered roof framing system, is similar to a number of buildings on the Marysville-Pilchuck High School campus. The concept upgrade recommendations discussed in this report can be adapted to these other similar buildings.

Reid Middleton performed a Tier 1 screening in accordance with the ASCE 41-17 standard *Seismic Evaluation and Retrofit of Existing Buildings*. The evaluation included field observations and review of record drawings to verify the existing construction. The structural seismic evaluation indicated that the building has multiple seismic deficiencies; the most susceptible ones being very tall and slender masonry walls at the library, out-of-plane wall anchorage, long unblocked diaphragm spans, and transfer of diaphragm loads to the masonry shear walls.

Conceptual seismic upgrade recommendations for the structural systems are provided to improve the performance of the building to meet the Life Safety structural performance objective criteria of ASCE 41-17. Sketches for the concept-level seismic upgrades are provided in Appendix B. The structural upgrades include strongbacking of the slender exterior masonry walls at the library, out-of-plane anchorage for the exterior masonry walls, adding blocking to strengthen the roof diaphragms, and framing connections to transfer diaphragm forces to the masonry shear walls. The recommendations for nonstructural upgrades are to laminate the large overhead clerestory windows at the east corner of the building and to further investigate the independent support of lighting fixtures in the dropped acoustical ceilings and presence of any natural gas line and shut-off valves in the building.

An opinion of probable construction costs is provided in Appendix C. It is our opinion that the total cost (construction costs plus soft costs) to upgrade the structure would range between \$2.59M and \$4.85M, with the baseline estimated total cost being \$3.23M.

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Acronyms

AACE	Association for the Advancement of Cost Engineering
ADA	Americans with Disabilities Act
ASCE	American Society of Civil Engineers
A-E	Architect-Engineer
BPOE	Basic Performance Objective for Existing Buildings
BSE	Basic Safety Earthquake
CMU	Concrete Masonry Unit
CP	Collapse Prevention
DNR	Department of Natural Resources
DCR	Demand-to-Capacity Ratio
EERI	Earthquake Engineering Research Institute
EPAT	EERI Earthquake Performance Assessment Tool
FEMA	Federal Emergency Management Agency
GC/CM	General Contractor / Construction Manager
GWB	Gypsum Wallboard
IBC	International Building Code
ICOS	Information and Condition of Schools
IEBC	International Existing Building Code
IO	Immediate Occupancy
LS	Life Safety
MCE	Maximum Considered Earthquake
MEP	Mechanical/Electrical/Plumbing
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Administration
OSPI	Office of Superintendent of Public Instruction
PBEE	Performance-Based Earthquake Engineering
PR	Position Retention
ROM	Rough Order-of-Magnitude
SSSSC	School Seismic Safety Steering Committee
UBC	Uniform Building Code
URM	Unreinforced Masonry
USGS	United States Geological Survey
WF	Wide Flange
WGS	Washington Geological Survey
WSSSSAP	Washington State School Seismic Safety Assessments Project

Reference List

Codes and References

2018 IBC, *2018 International Building Code,* prepared by the International Code Council, Washington, D.C.

AACE International Recommended Practice No. 56R-08, 2020, *Cost Estimate Classification System*, prepared by the Association for the Advancement of Cost Engineering International, Fairmont, West Virginia.

ASCE 7-16, 2017, *Minimum Design Loads for Buildings and Other Structures*, prepared by the Structural Engineering Institute of the American Society of Civil Engineers, Reston, Virginia.

ASCE 41-17, 2017, *Seismic Evaluation and Retrofit of Existing Buildings*, prepared by the Structural Engineering Institute of the American Society of Civil Engineers, Reston, Virginia.

FEMA E-74, 2011, *Reducing the Risks of Nonstructural Earthquake Damage: A Practical Guide*, prepared by Applied Technology Council, Redwood City, California.

Structural Engineers of Northern California, 2017, Earthquake Performance Rating System ASCE 41-13 Translation Procedure: The Buildings Ratings Committee, a sub-committee of the Existing Buildings Committee of The Structural Engineers Association of Northern California.

Structural Engineers of Northern California, 2015, Earthquake Performance Rating System User's Guide: The Buildings Ratings Committee, a sub-committee of the Existing Buildings Committee of The Structural Engineers Association of Northern California.

Drawings

Mallis, DeHart, Lands & Hall Architects, April 1969, existing architectural and structural drawings titled "Pilchuck High School, Vicinity Ziebel Road & Shoultes Road" for Marysville School District 25, Snohomish County, Washington (Library, "Building J")

1.0 Introduction

1.1 Background

In 2018-2019, the Washington Geological Survey (WGS), a division of the Department of Natural Resources (DNR), led a Washington State School Seismic Safety Assessments Project (WSSSSAP) that seismically and geologically screened 222 school buildings and 5 fire stations across Washington State to better understand the current level of seismic risk of Washington State's public-school buildings. This first phase of the WSSSSAP was executed with the help of Washington State's Office of Superintendent of Public Instruction (OSPI) and Reid Middleton, along with their team of structural engineers, architects, and cost estimators.

Building upon the success of Phase 1, WGS, OSPI, and Reid Middleton's team embarked on phase 2 of this project to seismically and geologically screen another 339 school buildings and 2 fire stations, mostly located in the high-seismic risk regions of Washington State. Similar to Phase 1, the two main components of Phase 2 of this seismic safety assessments project are: (1) geologic site characterization, and (2) the seismic assessment of buildings. As a part of the seismic assessments, Tier 1 screening of structural systems and nonstructural assessments were performed in accordance with the American Society of Civil Engineers' (ASCE) Standard 41-17 *Seismic Evaluation and Retrofit of Existing Buildings*. Concept-level seismic upgrades were developed to address the identified deficiencies of a select number of school buildings to evaluate seismic upgrade strategies, feasibilities, and implementation costs.

Seventeen school buildings were selected in consultation with WGS and Office of Superintendent of Public Instruction (OSPI) to receive concept-level seismic upgrade designs utilizing the ASCE 41 Tier 1 evaluation results. This report documents the concept-level seismic upgrade design for one of those school buildings. The concept-level seismic upgrades will include structural and nonstructural seismic upgrade recommendations, with concept-level sketches and rough order-of-magnitude (ROM) construction costs determined for each building. The seventeen school buildings were selected from the list of schools with the intent of representing a variety of regions, building uses, construction eras, and construction materials.

The overall goal of the project is to provide a better understanding of the current seismic risk of our state's K-12 school buildings and what needs to be done to improve the buildings in accordance with ASCE 41 to meet seismic performance objectives.

The seismic evaluation consists of a Tier 1 screening for the structural systems performed in accordance with ASCE 41-17.

1.2 Scope of Services

The project is being performed in several distinct and overlapping phases of work. The scope of this report is as listed in the following sections.

1.2.1 Information Review

1. Project Research: Reid Middleton and their project team researched available school building records, such as relevant site data and record drawings, in advance of the field investigations. This research included searching school building records and contacting the districts and/or the Office of Superintendent of Public Instruction (OSPI) to obtain building plans, seismic reports, condition reports, or related construction information useful for the project.

2. Site Geologic Data: Site geological data provided by the WGS, including site shear wave velocities, was utilized to determine the project Site Class in accordance with ASCE 41, which is included in the Tier 1 checklists and concept-level seismic upgrades design work.

1.2.2 Field Investigations

1. Field Investigations: Each of the identified buildings was visited to observe the building's age, condition, configuration, and structural systems for the purposes of the ASCE 41 Tier 1 seismic evaluations. This task included confirmation of general information in building records or layout drawings and visual observation of the structural condition of the facilities. Engineer field reports, notes, photographs, and videos of the facilities were prepared and utilized to record and document information gathered in the field investigation work.

2. Limitations Due to Access: Field observation efforts were limited to areas and building elements that were readily observable and safely accessible. Observations requiring access to confined spaces, potential hazardous material exposure, access by unsecured ladder, work around energized equipment or mechanical hazards, access to areas requiring Occupational Safety and Health Administration (OSHA) fall-protection, steep or unstable slopes, deteriorated structural assemblies, or other conditions deemed potentially unsafe by the engineer were not performed. Removal of finishes (e.g., gypsum board, lath and plaster, brick veneer, roofing materials) for access to concealed conditions or to expose elements that could not otherwise be visually observed and assessed was not performed. Material testing or sampling was not performed. The ASCE checklist items that were not documented due to access limitations are noted.

1.2.3 Seismic Evaluations and Conceptual Upgrades Design

1. Seismic Evaluations: Limited seismic assessments of the structural and nonstructural systems of the school buildings were performed in accordance with ASCE 41-17 Tier 1 Evaluation Procedures.

2. Conceptual Upgrades Design: Further seismic evaluation work was performed to provide concept-level seismic retrofits and/or upgrade designs for the selected school buildings based on the results of the Tier 1 seismic evaluations. The concept-level seismic upgrades design work included narrative descriptions of proposed seismic retrofits and/or

upgrade schemes and concept sketches depicting the extent and type of recommended structural upgrades.

3. Architectural Review: The seismic upgrade concept developed by the structural engineers was reviewed by Dykeman Architects for general guidance and consideration of the architectural aspects of the seismic upgrade. The architects discussed the seismic upgrade concepts with the structural engineer and reviewed existing drawings that were available, pictures taken during the engineer's field investigations, and the ASCE 41 Tier 1 Screening reports. However, field visits by the architect and meetings with the school district and facilities personnel to discuss phasing and programming requirements were not included in the project scope of work. The architectural considerations are discussed in section 4.4 Nonstructural Recommendations and Considerations. These conceptual designs were reviewed with high-level recommendations. Future planning for seismic improvements should include further review with a design team.

4. Cost Estimating: Through the concept-level seismic upgrades report process, ProDims, LLC, provided opinions of probable construction costs for the concept-level seismic upgrade designs for the selected school buildings. These concept-level seismic upgrade designs and the associated opinions of probable construction costs are intended to be representative samples that can be extrapolated to estimate the overall capital needs of seismically upgrading Washington State schools.

1.2.4 Reporting and Documentation

1. Conceptual Upgrade Design Reports: Buildings that were selected to receive a conceptual upgrade design will have a report prepared that will include an introduction summarizing the overall findings and recommendations, along with individual sections documenting each building's seismic evaluation, list of deficiencies, conceptual seismic upgrade sketches and opinions of probable construction costs.

2. Building Photography: Photos were taken of each building during on-site walkthroughs to document the existing building configurations, conditions, and structural systems. These are available upon request through DNR/WGS.

3. Existing Drawings: Select and available existing drawings and other information were collected during the evaluation process. These are available upon request through DNR/WGS.

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2.0 Seismic Evaluation Procedures and Criteria

2.1 ASCE 41 Seismic Evaluation and Retrofit Overview

The current standard for seismic evaluation and retrofit (upgrades) of existing buildings is ASCE 41-17. ASCE 41 provides screening and evaluation procedures used to identify potential seismic deficiencies that may require further investigation or hazard mitigation. It presents a three-tiered review process, implemented by first following a series of predefined checklists and "quick check" structural calculations. Each successive tier is designed to perform an increasingly refined evaluation procedure for seismic deficiencies identified in previous tiers in the process. The flow chart in Figure 2.1 illustrates the evaluation process.

TIER 1 – Screening Phase
- Checklists of evaluation statements to quickly identify potential deficiencies
- Requires field investigation and/or review of record drawings
- Analysis limited to "Quick Checks" of global elements
- May proceed to Tier 2, Tier 3, or rehabilitation design if deficiencies are identified

TIER 2 – Evaluation Phase
- "Full Building" or "Deficiency Only" evaluation
- Address all Tier 1 seismic deficiencies
- Analysis more refined than Tier 1, but limited to simplified linear procedures
- Identify buildings not requiring rehabilitation

TIER 3 – Detailed Evaluation Phase
- Component-based evaluation of entire building using reduced ASCE 41 forces
- Advanced analytical procedures available if Tier 1 and/or Tier 2 evaluations are judged to be overly conservative
- Complex analysis procedures may result in construction savings equal to many times their cost

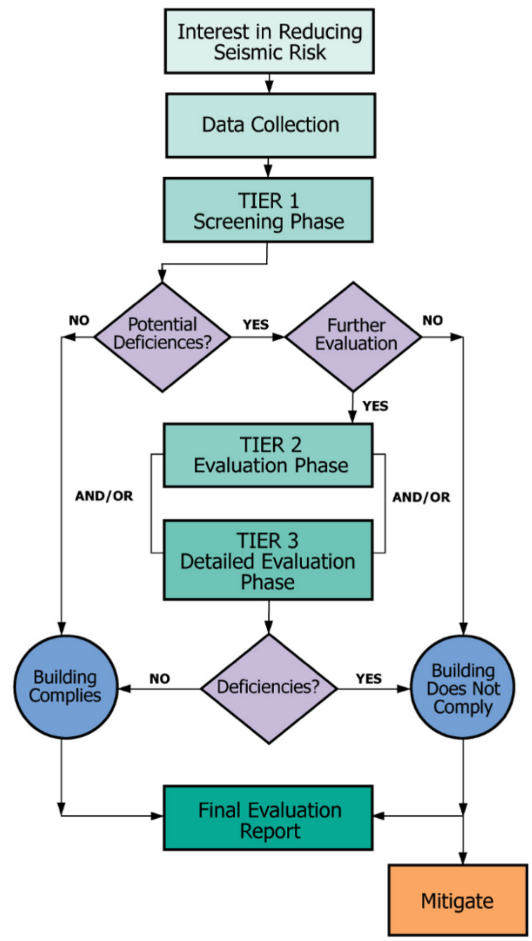

Figure 2-1. Flow Chart and Description of ASCE 41 Seismic Evaluation Procedure.

The Tier 1 checklists in ASCE 41 are specific to each common building type and contain seismic evaluation statements based on observed structural damage in past earthquakes. These checklists screen for potential seismic deficiencies by examining the lateral-force-resisting systems and details of construction that have historically caused poor seismic performance in similar buildings. Tier 1 screenings include basic "Quick Check" analyses for primary components of the lateral system. Tier 1 screenings also include prescriptive checks for proper seismic detailing of connections, diaphragm spans and continuity, and overall system configuration.

Tier 2 evaluations then follow with more-detailed structural and seismic calculations and assessments to either confirm the potential deficiencies identified in the Tier 1 review or demonstrate their adequacy. A Tier 3 evaluation involves an even more detailed analysis and advanced structural and seismic computations to review each structural component's seismic demand and capacity. A Tier 3 evaluation is similar in scope and complexity to the types of analyses often required to design a new building in accordance with the International Building Code (IBC), with a comprehensive analysis aimed at evaluating each component's seismic performance. Generally, Tier 3 evaluations are not practical for typical and regular-type buildings due to the rigorous and complicated calculations and procedures. As indicated in the Scope of Services, this evaluation included a Tier 1 screening of the structural systems.

2.2 Seismic Evaluation and Retrofit Criteria

Performance-Based Earthquake Engineering (PBEE) can be defined as the engineering of a structure to resist different levels of earthquake demand in order to meet the needs and performance objectives of building owners and other stakeholders. ASCE 41 employs a PBEE design methodology that allows building owners, design professionals, and the local building code authorities to establish seismic hazard levels and performance goals for individual buildings.

2.2.1 Site Class Definition

The building site class definition quantifies the site soil's propensity to amplify or attenuate earthquake ground motion propagating from underlying rock. Site class has a direct impact on the seismic design forces utilized to design and evaluate a structure. There are six distinct site classes defined in ASCE 7-16, Site Class A through Site Class F, that range from hard rock to soils that fail such as liquefiable soils. Buildings located on soft or loose soils will typically sustain more damage than similar buildings located on stiff soils or rock, all other things being equal. The Washington State Department of Natural Resources measured the time-averaged shear-wave velocity at each site to 30 meters (100 feet) below the ground surface, Vs30. This measured shear-wave velocity was used to determine the site class. The site for this building was determined to be **Site Class D**.

2.2.2 Marysville-Pilchuck High School Seismicity

Seismic hazards for the United States have been quantified by the United States Geological Survey (USGS). The information has been used to create seismic hazard maps, which are currently used in building codes to determine the design-level earthquake magnitudes for building design.

The Level of Seismicity is categorized as Very Low, Low, Moderate, or High based on the probabilistic ground accelerations. Ground accelerations and mass generate inertial (seismic) forces within a building (Force = mass x acceleration). Ground acceleration therefore is the parameter that classifies the level of seismicity. From geographic region to region, as the ground accelerations increase, so does the level of seismicity (from low to high). Where this building is located, the design short-period spectral acceleration, S_{DS}, is 0.769 g, and the design 1-second period spectral acceleration, S_{D1}, is 0.492 g. Based on ASCE 41 Table 2-4, the Level of Seismicity for this building is classified as **High**.

The ASCE 41 Basic Performance Objective for Existing Buildings (BPOE) makes use of the Basic Safety Earthquake – 1E (BSE-1E) seismic hazard level and the Basic Safety Earthquake – 2E (BSE-2E). The BSE-1E earthquake is defined by ASCE 41 as the probabilistic ground motion with a 20 percent probability of exceedance in 50 years, or otherwise characterized as a ground motion acceleration with a probabilistic 225-year return period. The BSE-2E earthquake is defined by ASCE 41 as the probabilistic ground motion with a 5 percent probability of exceedance in 50 years, or otherwise characterized as a ground motion acceleration with a probabilistic 975-year return period. The BSE-2N seismic hazard level is the Maximum Considered Earthquake (MCE) ground motion used in current codes for the design of new buildings and is also used in ASCE 41 to classify the Level of Seismicity for a building. The BSE-2N has a statistical ground motion acceleration with 2 percent probability of exceedance in 50 years, or otherwise characterized as a ground motion acceleration with a probabilistic 2,475-year return period.

Table 2.2.1-1 provides the spectral accelerations for the 225-year, 975-year, and 2,475-year return interval events specific to Marysville-Pilchuck High School that are considered in this study.

Table 2.2.1-1. Spectral Acceleration Parameters (Class Site D).

BSE-1E 20%/50 (225-year) Event		BSE-1N 2/3 of 2,475-year Event		BSE-2E 5%/50 (975-year) Event		BSE-2N 2%/50 (2,475-year) Event	
0.2 Seconds	0.590 g	0.2 Seconds	0.769 g	0.2 Seconds	0.959 g	0.2 Seconds	1.154 g
1.0 Seconds	0..3 g	1.0 Seconds	0.492 g	1.0 Seconds	0.584 g	1.0 Seconds	0.738 g

2.2.3 Marysville-Pilchuck High School Structural Performance Objective

The school building is an Educational Group E occupancy (Risk Category III) structure and has not been identified as a critical structure requiring immediate use following an earthquake. However, Risk Category III buildings are structures that represent a substantial hazard to human life in the event of failure. According to ASCE 41, the BPOE for Risk Category III structures is the Damage Control structural performance level at the BSE-1E seismic hazard level and the Limited Safety structural performance level at the BSE-2E seismic hazard level. The ASCE 41 Tier 1 evaluations were conducted in accordance with ASCE 41 requirements and ASCE 41 seismic performance levels. Concept-level upgrades were developed for the **Life Safety** structural performance level at the **BSE-1N** seismic hazard level in accordance with DNR direction, the project scope of work, and the project legislative language.

At the Life-Safety performance level, the building may sustain damage while still protecting occupants from life-threatening injuries and allowing occupants to exit the building. Structural and nonstructural components may be extensively damaged, but some margin against the onset of partial or total collapse remains. Injuries to occupants or persons in the immediate vicinity may occur during an earthquake; however, the overall risk of life-threatening injury as a result of structural damage is anticipated to be low. Repairs may be required before reoccupying the building, and, in some cases, repairs may be economically unfeasible.

Knowledge Factor

A knowledge factor, *k*, is an ASCE 41 prescribed factor that is used to account for uncertainty in the as-built data considering the selected Performance Objective and data collection processes (availability of existing drawings, visual observation, and level of materials testing). No in-situ testing of building materials was performed; however, some material properties and existing construction information were provided in the existing record drawings. If the concept design is developed further, additional materials tests and site investigations will be required to substantiate assumptions about the existing framing systems.

ASCE 41 Classified Building Type

Use of ASCE 41 for seismic evaluations requires buildings to be classified from a group of common building types historically defined in previous seismic evaluation standards (ATC-14, FEMA 310, and ASCE 31-03). The school is classified in ASCE 41 Table 3-1 as a reinforced masonry shear wall building with flexible diaphragms, **RM1**. Reinforced masonry shear wall buildings (RM1) include those that have bearing shear walls constructed of reinforced masonry with elevated floor and roof framing structural systems consisting of wood framing.

2.3 Report Limitations

The professional services described in this report were performed based on available record drawing information and limited visual observation of the structure. No other warranty is made as to the professional advice included in this report. This report provides an overview of the seismic evaluation results and does not address programming and planning issues. This report has been prepared for the exclusive use of DNR/WGS and is not intended for use by other parties, as it may not contain sufficient information for purposes of other parties or their uses.

3.0 Building Description & Seismic Evaluation Findings

3.1 Building Overview

3.1.1 Building Description

Original Year Built: 1970
Building Code: 1967 UBC

Number of Stories: 1
Floor Area: 19,772 SF

FEMA Building Type: RM1
ASCE 41 Level of Seismicity: High
Site Class: D

Building J at Marysville Pilchuck Senior High School is a single-story, 20,000-square-foot masonry building and is the library building on this high school campus. The building was constructed in 1970 and has a footprint of approximately 165 feet by 165 feet. The building features a large-volume library space with 16- to 28-foot-tall exterior concrete masonry unit (CMU) walls and a vaulted roof consisting of glulam arches and girders that clear span 110 feet by 110 feet to the exterior walls. The library area is surrounded at the west and east corners by classroom, storage, and office space with a lower flat roof. The areas around the library also have exterior stack bond concrete masonry walls and a wood-framed roof.

3.1.2 Building Use

The Main Building has multiple classrooms, a science lab, a library, and various administrative spaces. The building has a small 400-square-foot fan room above the middle corridor in the middle of the building.

3.1.3 Structural System

Table 3.1.3-1. Structural System Descriptions.

Structural System	Description
Structural Roof over Library	The portion of the library built in 1962 is 1-inch diagonal sheathing lap over 2x12s at 16 inches on center spanning to pitched and arched glulam beams that bear on pipe columns embedded in concrete masonry walls. The portion of library added on in 1966 is of similar construction, except it is sheathed with plywood instead of 1-inch diagonal sheathing.

Table 3.1.3-1. Structural System Descriptions.

Structural System	Description
Structural Roof over Classrooms and Admin	The roof is sheathed with 5/8-inch and 3/4-inch plywood on the north half and south half, respectively, over tapered open-web joists spaced at 32 inches and 48 inches on center on the north half and south half, respectively. The roof over the corridors is framed with 2x8s at 16 inches on center.
Structural Floor(s)	The main floor is a 4-inch-thick concrete slab on grade reinforced with welded wire mesh. The small fan room over the corridor is a 3-inch concrete slab over 12-inch-deep steel bar joists at 24 inches on center.
Foundations	Foundations consist of cast-in-place concrete strip footings supporting the masonry bearing walls and shear walls and thickened slab footings under the transverse wood shear walls.
Gravity System	The gravity system primarily consists of a wood-framed roof spanning in the north-south direction from the exterior to the interior corridor and supported by reinforced CMU bearing walls.
Lateral System	The lateral system consists of a plywood roof diaphragm supported by stack bond reinforced masonry shear walls along the exterior and interior corridor and by transverse plywood-sheathed and wood-framed shear walls between the classrooms. The masonry shear walls are the exterior walls of the building, the interior corridor walls running down the length of the building, and an interior transverse shear wall separating the library and the science lab. The exterior walls of the 1962 library are unreinforced double-wythe CMU cavity wall.

3.1.4 Structural System Visual Condition

Table 3.1.4-1. Structural System Condition Descriptions.

Structural System	Description
Structural Roof	No visible signs of corrosion, damage, or deterioration.
Structural Roof	Did not observe signs of corrosion, damage, or deterioration. Also did not see any significant areas of water-damaged ceiling tiles.
Foundations	Foundations and slabs on grade appear to be in good condition. Did not observe signs of damage, distress, or settlement.
Masonry Walls	The masonry walls appear to be in good condition. Did not observe signs of damage, deterioration, or distress in the masonry walls or mortar joints.

3.2 Seismic Evaluation Findings

3.2.1 Structural Seismic Deficiencies

The structural seismic deficiencies identified during the Tier 1 evaluation are summarized below. Commentary for each deficiency is provided based on this evaluation.

Table 3.2.1-1. Identified Structural Seismic Deficiencies Based on Tier 1 Checklists.

Deficiency	Description
Adjacent Buildings	The covered walkway attached to this structure is immediately adjacent to the covered walkway attached to the adjacent structure.
Reinforcing Steel	The minimum of 0.0007 in either of the two directions is not satisfied. Vertical reinforcing steel consists of #4 at 48 inches on center, which produces a reinforcing ratio of 0.00055.
Foundation Dowels	The south, west, and north masonry cavity walls of the 1962 library were not detailed to have vertical dowels connecting the 8-inch masonry backup wall to the foundation.
Cross Ties	Continuous cross-ties are not present in longitudinal (east-west) direction.
Wall Anchorage	Exterior and interior masonry bearing walls were not detailed to have out-of-plane anchorage or bracing to the roof diaphragm.
Wood Ledgers	The lower roof that frames in to the east face of the masonry wall, between the library and science lab, is supported by a 3x ledger without wall anchor ties directly attached to the diaphragm.

3.2.2 Structural Checklist Items Marked as "U"nknown

Where building structural component seismic adequacy was unknown due to lack of available information or limited observation, the structural checklist items were marked as "unknown". These items require further investigation if definitive determination of compliance or noncompliance is desired. The unknown structural checklist items identified during the Tier 1 evaluation are summarized below. Commentary for each unknown item is provided based on the evaluation.

Table 3.2.2-1. Identified Structural Checklist Items Marked as Unknown.

Deficiency	Description
Liquefaction	"Low to moderate" liquefaction potential is identified per ICOS based on state geologic mapping. Requires further investigation by a licensed geotechnical engineer to determine liquefaction potential.

Table 3.2.2-1. Identified Structural Checklist Items Marked as Unknown.

Deficiency	Description
Slope Failure	Requires further investigation by a licensed geotechnical engineer to determine susceptibility to slope failure. The structure appears to be located on a relatively flat site.
Surface Fault Rupture	Requires further investigation by a licensed geotechnical engineer to determine whether site is near locations of expected surface fault ruptures.
Load Path and Transfer to Shear Walls	The panel edge nailing and extent of the plywood sheathing on the pony stud walls on top of the masonry bearing walls. These plywood-sheathed walls transfer the seismic forces from the roof diaphragm to the masonry shear walls and should be further investigated to determine if this is a complete load path.

3.2.3 Nonstructural Seismic Deficiencies

Table 3.2.3-1 summarizes the seismic deficiencies in the nonstructural systems. The Tier 1 screening checklists are provided in Appendix A.

Table 3.2.3-1. Identified Nonstructural Seismic Deficiencies based on Tier 1 Checklists.

Deficiency	Description
M-1 Masonry Veneer Ties	The west, north, and south walls of the 1962 library are masonry cavity walls with a 4-inch CMU veneer (outer cavity) that was not detailed to have out-of-plane anchor ties to the 8-inch CMU backing wall.
M-3 Weakened Planes	Veneer out-of-plane anchor ties are not specified in the existing drawings.
M-4 Unreinforced Masonry Backup	The 8-inch masonry backup wall does not have vertical reinforcing to span from the ground to the roof diaphragm.
M-6 Masonry Backup Anchorage	The 8-inch masonry backup wall does not have out-of-plane connections to the roof diaphragm.

3.2.4 Nonstructural Checklist Items Marked as “U”nknown

Where building nonstructural component seismic adequacy was unknown due to lack of available information or limited observation, the nonstructural checklist items were marked as “unknown”. These items require further investigation if definitive determination of compliance or noncompliance is desired. The unknown nonstructural checklist items identified during the

Tier 1 evaluation are summarized below. Commentary for each unknown item is provided based on the evaluation.

Some nonstructural deficiencies may be able to be mitigated by school district staff. Other nonstructural components that require substantial mitigation may be more appropriately included in a long-term mitigation strategy. Some typical conceptual details for the seismic upgrade of nonstructural components can be found in the FEMA E-74 Excerpts appendix.

Table 3.2.4-1. Identified Nonstructural Checklist Items Marked as Unknown.

Deficiency	Description
LSS-1 Fire Suppression Piping; LSS-2 Flexible Couplings; and LSS-5 Sprinkler Ceiling Clearance	A fire suppression system was not observed. The school district should verify if the building contains a fire suppression system. If so, based on the age of the building, it is likely that the seismic bracing, coupling, and sprinkler head clearances of the fire suppression piping does not comply with current NFPA 13 requirements.
LSS-3 Emergency Power	Facility staff should verify if emergency power is being used to power or control Life Safety systems, and if so, further investigate to see if this equipment is adequately anchored or braced.
HM-1 Hazardous Material Equipment; HM-2 Hazardous Material Storage; HM-3 Hazardous Material Distribution; HM-4 Shutoff Valves	It is unknown if the structure contains hazardous materials. Maintenance and facility staff should verify presence of hazardous materials, including natural gas, and if present, further investigate the equipment, piping, coupling, and shutoff valves to mitigate seismic risk.
P-4 Light Partitions Supported by Ceilings	Light-frame partition walls along paths of egress (exiting/egress corridor walls) should be investigated and checked for proper seismic bracing at the top of the walls to mitigate the risk of toppling and becoming obstructions in the paths of egress.
C-2 Suspended Gypsum	Based on review of the existing drawings and site visit, gypsum wallboard (GWB) ceilings occur in the restrooms and the utility rooms. Based on the age of the building it is likely that large areas of GWB ceilings are noncompliant if they are not directly attached to the roof structure. Most ceilings on the interior of the building appear to be acoustic tile ceilings. Further investigation should be performed for the GWB ceiling construction in the restrooms or other occupied areas with large GWB ceiling areas, especially over paths of egress. Supplemental bracing or reconstruction of these GWB areas may be appropriate to mitigate seismic risk.

Table 3.2.4-1. Identified Nonstructural Checklist Items Marked as Unknown.

Deficiency	Description
C-3 Integrated Ceilings	Integrated suspended ceiling systems above paths of egress (exiting/egress corridors) should be investigated and checked for proper seismic bracing and edge clearance detailing to mitigate the risk of becoming fallen obstructions in the paths of egress.
LF-1 Independent Support	The light fixtures in the main corridor are supported within an integrated ceiling system, which is over a path of egress. Maintenance and facility staff should verify that each fixture is independently supported to the roof structure from opposite corners and add wire supports as necessary.
CF-2 Tall Narrow Contents	The bookshelves in the library are backed up to the walls of the library, but it is unknown if these shelving units are anchored to the backing walls. Maintenance and facility staff should verify that the tops of the shelving units are braced or anchored to the nearest backing wall or provide overturning base restraint.
ME-1 Fall-Prone Equipment, ME-2 In-Line Equipment, ME-3 Tall-Narrow Equipment	This was not able to be verified during the site investigation. Further investigation should be performed to see if bracing or anchoring of fall-prone and overhead falling hazard equipment exists. Additional bracing may be appropriate to mitigate seismic risk.

4.0 Recommendations and Considerations

4.1 Seismic-Structural Upgrade Recommendations

Concept-level seismic upgrade recommendations to improve the lateral-force-resisting system were developed. The sketches in Appendix B depict the concept-level structural upgrade recommendations outlined in this section. The following concept recommendations are intended to address the structural deficiencies noted in Table 3.2.1-1. This concept-level seismic upgrade design represents just one of several alternative seismic upgrade design solutions and is based on preliminary seismic evaluation and analysis results. Final analysis and design for seismic upgrades must include a more detailed seismic evaluation of the building in its present or future configuration. Proposed seismic upgrades include the following.

4.1.1 Strongbacking of Slender Exterior Masonry Walls at the Library

The exterior 8-inch CMU walls at the north and south corners of the library are 16 to 28 feet tall and vertically reinforced with #6 at 48 inches on center. There are 16 inch by 16 inch pilasters at approximately 14 feet on center within these walls; however, many of them do not have direct diaphragm restraint at the top of the pilaster. It is recommended that these walls are strongbacked on the exterior face of CMU with HSS 7x3 members at 40 inches on center max (to work with the 14-foot pilaster spacing). The HSS 7x3 strongbacks should be full height and anchored to the existing walls at 4 feet on center. There is single course band of 12-inch CMU at approximately 8 feet above finished floor that the HSS 7x3 strongbacks will need to notch around. These strongbacks will help the exterior wall span to the roof diaphragm where additional out-of-plane anchorage is recommended, see Section 4.1.5 below.

4.1.2 Shotcrete Shear Wall at the Northeast Exterior Wall of the Library

The existing CMU walls are reinforced vertically with #6 at 48 inches on center and horizontally reinforced with K-web joint reinforcing at 16 inches on center. Due to the window and door openings that were subsequently added in the northeast exterior wall of the library, this CMU shear wall will be overstressed at a code-level seismic event unless both of these door and window openings are infilled with CMU to restore the 50-foot length of shear wall. To preserve the current use of the spaces that use this door and window, it is recommended that this CMU shear wall be strengthened with a shotcrete shear wall. This shotcrete shear wall will also require foundation strengthening to distribute shear wall overturning loads for soil bearing.

4.1.3 Stud Wall Strengthening Under the Mechanical Mezzanine

The existing drawings do not indicate sheathing on the interior bearing walls that support the wood-framed mechanical mezzanine above the librarian's area at the west corner of the library. To locally support the mechanical mezzanine floor system, it is recommended that these walls be sheathed with 1/2-inch plywood and that this wall be blocked and nailed as a shear wall. The existing anchor bolts should be verified to be spaced at a maximum of 4 feet on center, and new hold-downs should be installed at each end of the strengthened shear walls.

4.1.4 Diaphragm Strengthening at the Low and High Roofs

The layered roof diaphragm of plywood sheathing over 2x3 stripping spaced at 24 inches on center spanning over 2x joists at 16 inches on center does not provide direct load path from the plywood roof diaphragm to the CMU shear walls below. The existing drawings also do not indicate that blocking was to be installed at unframed panel edges, which likely results in an unblocked plywood diaphragm. It is recommended that the existing roofing and ceilings be removed and replaced to access the roof diaphragm, blocking be installed at all unframed panel edges, and the existing plywood sheathing be nailed at all panel edges with additional nailing. The removal and replacement of the of the existing roofing and ceiling will also provide access to upgrade the diaphragm connections and out-of-plane anchorage connections recommended in Sections 4.1.5 and 4.1.6 below.

4.1.5 Out-of-Plane Wall Anchorage and Bracing to the Roof Diaphragm

The tops of the existing CMU walls are braced at the glulam girders that are supported by the CMU walls or pilasters. However, the spacing and tributary area to these glulam girders and their connections will likely be overstressed during a code-level seismic event. At the lower roofs, it is recommended that additional out-of-plane wall anchorage be installed at the top of the wall and in between the existing glulam girders. This additional anchorage can be accomplished with tension ties, such as Simpson LTT, that anchor to the top of the CMU wall and connect to additional wood blocking and metal strapping that distributes the anchorage load adequately to the roof diaphragm. Where existing roof joists bear on top of the CMU walls, additional connectors, such as Simpson HGA10 clips, should be installed to connect the existing roof joists to the existing sill plate on top of the CMU wall. At the upper roof and tops of the slender CMU walls at the library, the existing roof joists that span diagonally across the exterior masonry walls should also be attached to the existing sill plate with HGA10 connectors.

4.1.6 Load Path to the Masonry Shear Walls

The existing plywood roof-sheathing diaphragm is not directly or adequately connected to the CMU shear walls for a code-level seismic event. It is recommended that additional blocking and connectors be installed to provide a direct load path from the plywood roof sheathing to the existing 2x rim joists or blocking and then to the 2x sill plate that is on top of the CMU walls. At the top of the CMU walls of the library and at select CMU walls supporting the low roof, the existing sill plate anchor bolt connections are also not adequate to transfer the in-plane seismic forces to the CMU shear walls for a code-level seismic event. The existing drawings indicate the sill plates are anchored with 1/2-inch-diameter anchor bolts at 4 feet on center. This sill plate connection should be strengthened with Simpson FRFP retrofit foundation plate anchors at 4 feet on center.

4.1.7 Interconnection of Glulam Roof Girders

The existing drawings indicate glulam-to-glulam girder connections; however, it is recommended that the interconnection be strengthened so that the girder lines can adequately act as continuous ties across the large roof diaphragm over the library. Also, the existing drawings do not indicate a connection of the 2x roof joists or blocking bearing on top of the glulam girders at both the low and high roofs and are assumed to only be toenailed to the tops of the glulam girders, as was conventional during the original construction of the high school. It is recommended that Simpson H1 and A35 clips be installed to provide in-plane and positive connections of the glulam beams to the roof diaphragm and roof framing.

4.1.8 Diaphragm Strengthening at the Mechanical Mezzanine

The existing mezzanine framing consists of 2x tongue-and-groove decking over 2x joists at 12 inches on center. The relatively low capacities of single straight-sheathed diaphragms, such as tongue-and-groove decking, often gets seismically strengthened with a wood-structural panel overlay such as plywood or oriented strand board (OSB). However, because this floor is a mechanical mezzanine and supports mechanical equipment, ductwork, and piping, it is recommended that the mezzanine framing system be sheathed to the underside of the floor framing system with 1/2-inch plywood to serve as a diaphragm for the mezzanine floor. If replacing the mechanical equipment and associated ductwork and piping is part of a future modernization scope, a plywood overlay on top of the existing tongue-and-groove decking should be installed prior to the installation of the new mechanical system.

4.2 Foundations and Geotechnical Considerations

A detailed geotechnical analysis of the site soils was not included in the scope of this study. As a result, the geotechnical seismic effects on the existing building and its foundations, such as the presence of liquefiable soils and allowable soil bearing pressures, are unknown at this time. However, although the Vs30 measurement for this site is 304 m/s (997 ft/s) and within Site Class D parameters and can sometimes be associated with liquefiable soils. Based on state of Washington liquefaction mapping, this building is located on soils classified with a low to moderate susceptibility of liquefaction. The presence of liquefiable soils should be further investigated and reviewed by a licensed geotechnical engineer.

Liquefaction is the tendency of certain soils to saturate and lose strength during strong earthquake shaking, causing it to flow and deform similar to a liquid. Liquefaction, when it occurs, drastically decreases the soil bearing capacity and tends to lead to large differential settlement of soil across a building's footprint. Liquefaction can also cause soils to spread laterally and can dramatically affect a building's response to earthquake motions, all of which can significantly compromise the overall stability of the building and possibly lead to isolated or widespread collapse in extreme cases. Existing foundations damaged as a result of liquefiable soils also make the building much more difficult to repair after an earthquake.

Buildings that are not founded on a raft foundation or deep foundation system (such as grade beams and piles), and those with conventional strip footings and isolated spread footings that are not interconnected well with tie beams, are especially vulnerable to liquefiable soils. Mitigation techniques used to improve structures in liquefiable soils vary based on the type and amount of liquefiable soils and may include ground improvements to densify the soil (aggregate piers, compaction piling, jet grouting), installation of deep foundations (pin piling, augercast piling, micro-piling), and installation of tie beams between existing footings.

The existing Marysville-Pilchuck High School Library is founded on shallow foundations. The soil capacity to resist seismic demands is unknown at this time. It is recommended that a detailed geotechnical study and investigation be completed on the building site to determine the nature of the liquefaction hazard and the characteristics of the site soils. Foundation mitigation and ground improvement may be required and the recommended geotechnical investigation could have a major impact on the scope of work required for seismic retrofit.

4.3 Tsunami Considerations

The building is not located in a tsunami inundation zone according to Washington State Department of Natural Resources tsunami inundation mapping. It is not necessary to consider tsunamis when planning seismic upgrades to this building.

4.4 Nonstructural Recommendations and Considerations

Table 3.2.3-1 identifies nonstructural deficiencies that do not meet the performance objective selected for Marysville-Pilchuck High School. It is recommended that these deficiencies be addressed to provide nonstructural performance consistent with the performance of the upgraded structural lateral-force-resisting system. As-built information for the existing nonstructural systems, such as fire sprinklers, mechanical ductworks, and piping, are not available for review. Only limited visual observation of the systems was performed during field investigation due to limited access or visibility to observe existing conditions. The conceptual mitigation strategies provided in this study are preliminary only. The final analysis and design for seismic rehabilitation should include a detailed field investigation.

4.4.1 Architectural Systems

This section addresses existing construction that, while not posing specific hazards during a seismic event, would be affected by the seismic improvements proposed.
For any remodel project of an existing building, the International Existing Building Code (IEBC) would be applicable. The intent of the IEBC is to provide flexibility to permit the use of alternative approaches to achieve compliance with minimum requirements to safeguard the public health, safety, and welfare insofar as they are affected by the work being done.

Energy Code

Elements of the exterior building envelope being affected by the seismic work would also be required to be brought up to the current Washington State Energy Code per Chapter 5, where applicable.

Accessibility

It should also be noted that, as a part of any upgrade to existing buildings, the IEBC will require that any altered primary function spaces (classrooms, gyms, entrances, offices) and routes to these spaces, be made accessible to the current accessibility standards of the Americans with Disabilities Act (ADA), unless technically infeasible. This would include but is not limited to accessible restrooms, paths of travel, entrances and exits, parking, signage, and fire alarm systems. Under no circumstances should the facility be made less accessible. The IEBC does, however, have exceptions for areas that do not contain a primary function (storage room, utility rooms) and states that costs of providing the accessible route are not required to exceed 20 percent of the costs of the alterations affecting the area of Primary Function.

As with any major renovation and modernization, an ADA study would be recommended to determine the extent to which an existing facility needs to be improved to be in compliance with the ADA.

Hazardous Materials Survey

It is recommended that all existing construction be surveyed for the presence of hazardous materials. Elements such as floor tile, adhesive, and pipe insulation could contain asbestos. Lead may be present in paint and light fixtures may contain PCB ballasts. A hazardous materials survey and abatement of the buildings should be performed prior to the start of any demolition work.

Strongback Slender Exterior Walls at the Library

Vertical strongbacks installed at the north and south corners of the library are recommended to be furred out with metal siding over metal stud framing. CMU pilasters and approximately 1'-6" on either side of the pilasters could remain as-is. Relocation of exterior light fixtures will be required.

Shotcrete Shear Wall at the Northwest Exterior Wall of the Library

A new shotcrete wall and foundation will require removal and patch back of existing asphalt paving. It is recommended that the shotcrete wall be furred out with metal siding over metal stud framing.

Columns for Secondary Support

Floor and ceiling finishes will need to be removed and replaced within approximately 3 feet of the installation of new steel columns for secondary support of existing glulam beams. The columns should be furred out with shallow metal studs and finished with painted GWB.

Stud Wall Strengthening Under the Mechanical Mezzanine

To accommodate installation of new blocking and plywood sheathing, wall finishes, casework, and the existing ceiling and lighting should be removed. New GWB is recommended for the walls. Existing electrical outlets, switches, and other items will need to be reinstalled to accommodate the thickness of the new plywood sheathing. Paint and new rubber base should be installed to match adjacent wall finishes. The ceiling should be replaced with suspended acoustical ceiling system with LED lighting, in conformance with the current energy code. Existing casework should be reinstalled. Plywood is assumed to be installed on side of walls facing the Librarian room.

Diaphragm Strengthening at the Low and High Roofs

To accommodate installation of blocking and plywood sheathing, a new roof consisting of a vapor barrier, continuous rigid R-38 insulation, coverboard, and membrane roofing is recommended. It is assumed that new metal flashing will be required to accommodate the thicker insulation. The existing suspended ceiling in the low-roof areas and the direct-applied ceiling finish at the high-roof areas should be removed to allow access to diaphragm and other anchorage connections. Light fixtures in both areas will need to be removed. The ceilings in the low-roof areas should be replaced with suspended acoustical ceiling systems. New LED light fixtures, in conformance with the current energy code, are recommended. The ceilings in the high-roof areas should be replaced with 5/8-inch GWB, at a minimum. The District may want to consider an acoustical evaluation to determine if additional acoustical material would benefit the performance of the space. New LED light fixtures, in conformance with the current energy code, are recommended.

Out-of-Plane Wall Anchorage and Bracing to the Roof Diaphragm

This work may be accessed from the interior and will require removal and replacement of existing ceilings and light fixtures as described in the paragraph above.

Load Path to the Masonry Shear Walls

This work may be accessed from the interior and will require removal and replacement of existing ceilings and light fixtures as described in previous paragraphs.

Diaphragm Strengthening at the Mechanical Mezzanine

The existing ceiling system and lighting are required to be removed and replaced to fully access the underside of the mezzanine floor framing to allow for installation of new plywood sheathing. This work may be done in conjunction with the plywood shear wall work in the Librarian room, described in previous paragraphs.

Security Film (Laminating Film) for the Large Overhead Clerestory Windows

The large clerestory windows at the east corner of the library can become a dangerous and sharp overhead falling hazard if the glazing shatters during an earthquake due to excessive racking. Glazing panes larger than 16 square feet are typically recommended to consist of laminated glazing. It is recommended that the existing clerestory windows be laminated on the interior surface with a UV-resistant security film that can hold the glass in place if it shatters during a code-level seismic event.

Lighting Fixtures in Acoustical Ceiling Tile Systems

The light fixtures were observed, in several locations, to be supported by a suspended ceiling system. Maintenance and facility staff should verify that each fixture is independently supported to the roof structure from opposite corners and add wire supports as necessary.

Contents and Furnishings

Buildings often contain various tall and narrow furniture, such as shelving and storage units, that are freestanding away from any backing walls. High book shelving in the library, for example, can be highly susceptible to toppling if not anchored properly to the backing walls or to each other, and can become a life safety hazard. It is recommended that maintenance and facility staff verify that the tops of the shelving units are braced or anchored to the nearest backing wall or provide overturning base restraint. Heavy items weighing more than 20 pounds on upper shelves or cabinet furniture should also be restrained by netting or cabling to avoid becoming falling hazards to students or faculty below.

4.4.2 Mechanical Systems

The main seismic concerns for mechanical equipment are sliding, swinging, and overturning. Inadequate lateral restraint or anchorage can shift equipment off its supports, topple equipment to the ground, or dislodge overhead equipment, making them falling hazards. Investigation of above-ceiling mechanical equipment and systems was not part of this study, but an initial investigation for the presence of mechanical equipment bracing can be performed by maintenance and facility staff to see if equipment weighing more than 20 pounds with a center of mass more than 4 feet above the adjacent floor level is laterally braced. If bracing is not present, and the equipment poses a falling hazard to students and faculty below, further investigation is recommended by a structural engineer.

4.5 Opinion of Probable Conceptual Seismic Upgrades Costs

An opinion of probable project costs of the concept-level seismic upgrade recommendations provided in this report is included in Appendix C. The input of the scope of work to develop the probable costs are the Tier 1 checklists and the preliminary concept-level seismic upgrades design recommendations and sketches. These preliminary concept-level design sketches depict a design concept that could be implemented to improve the seismic safety of the building structure. It is important to note the preliminary seismic upgrades design concept is based on the results of the Tier 1 seismic screening checklists and engineering design judgement and has not been substantiated by detailed structural analyses and calculations.

For this preliminary opinion of probable costs, the estimate of construction costs of the preliminary scope of work is developed based on current 1st Quarter (1Q) 2021 costs. Costs are then escalated to 4Q 2022 at 6% per year of the baseline cost estimate. Costs are developed based on the Tier 1 checklist, concept-level seismic upgrade design sketches, and project narratives.

A range of the cost estimate of -20% (low) to +50% (high) is used to develop the range of the construction cost estimate for the concept-level scope of work. The -20% to +50% range guidance is from Table 1 of the AACE International Recommended Practice 56R-08, *Cost Estimate Classification System*. This estimate is classified as a Class 5 based on the level of design of 0% to 2%. The range of a Class 5 construction cost estimate based on the AACE guidance selected for this estimate is a -20% to +50%.

The estimated total cost (construction costs plus soft costs) to mitigate the deficiencies identified in the Tier 1 checklists of the Marysville-Pilchuck High School Library Building ranges between approximately $2.59M and $4.85M (-20%/+50%). The baseline estimated total cost to seismically upgrade this building is approximately $3.23M. On a per-square-foot basis, the baseline seismic upgrade cost is estimated to be approximately $162 per square foot in 4Q 2022 dollars, with a range between $130 per square foot and $243 per square foot.

4.5.1 Opinion of Probable Construction Costs

This conceptual opinion of construction cost includes labor, materials, equipment, and scope contingency, general contractor general conditions, home office overhead, and profit. This is based on a public sector design-bid-build project delivery method. Project delivery methods such as negotiated, state of Washington GC/CM, and design-build are not the basis of the construction costs. Owner's soft costs are described below in Section 4.5.2.

The cost is developed in 1Q 2021 costs. The costs are then escalated to 4Q 2022 using an escalation rate of 6.0% per year. If the mid-point of construction will occur at a date earlier or later than 4Q 2022, then it is appropriate to adjust the escalation to the revised mid-point of construction. Construction costs excluded from the estimate are site work, phasing of construction, additional building modifications not directly related to the seismic scope of work, off hours labor costs, accelerated schedule overtime labor costs, replacement/relocation/additional FF+E and building code changes that occur after this report.

For project budget planning purposes, it is highly recommended that the opinion of probable project costs is determined including: the overall construction budget of the seismic upgrade and additional scope of work for the building via the services of an A/E design team to study the proposed seismic mitigation strategies to refine the concept-level seismic upgrades design approach contained in this report, determine the construction timeline to adjust the escalation costs, define the construction phasing, if any, and the project soft costs.

4.5.2 Opinion of Probable A-E Design Budgets and Owner's Additional Project Costs (Soft Costs)

Additional owner's project costs would likely include owner's project administration costs, including project management, financing/bond costs, administration/contract/accounting costs, review of plans, value engineering studies, building permits, bidding costs, equipment, fixtures, furnishings and technology, and relocation of the school staff and students during construction. These costs are known as soft costs.

These soft costs have been included in the opinion of probable costs at 40% of the baseline probable construction cost for the seismic upgrade of this building.
The Soft Costs used for the projects that total to 40% are:
A+E Design - 10%
QA/QC Testing - 2%
Project Administration - 2%

Owner Contingency - 11%
Average Washington State Sales Tax - 9%
Building Permits - 6%

It is typical for soft costs to vary from owner to owner. Based upon our team members' experience on K-12 school projects in the state of Washington, it is our opinion that an allowance of 40% of the average probable construction cost is a reasonable and appropriate soft cost recommendation for planning purposes. We also recommend that each owner develop their own soft costs as part of their budgeting process and not rely solely on this recommended percentage.

4.5.3 Escalation Rate

A 6.0%/year construction cost escalation rate is used for planning purposes for the conceptual estimates. The rate is compounded annually to the projected midpoint of construction. This rate is representative of the escalation based on the previous five years of market experience of construction costs throughout the state of Washington and is projected going forward for these projects. This rate is calculated to the 4th Quarter of 2022 as an allowance for planning purposes. The actual construction schedule for the project is to be determined and we recommend the escalation cost be revised based on revised construction schedule using the 6%/year rate.

Table 4.5.3-1. Seismic Upgrades Opinion of Probable Construction Costs.

Building	FEMA Bldg Type	ASCE 41 Level of Seismicity / Site Class	Structural Performance Objective	Bldg Gross Area	Estimated Seismic Upgrade Cost Range $/SF (Total)	Estimated Seismic Upgrade Cost/SF (Total)
Marysville Pilchuck Senior High School	RM1	High / D	**Structural**			
			Life Safety	19,772 SF	$71 ($1.42M) - $134 ($2.65M)	$89 ($1.77M)
			Nonstructural			
			Life Safety	19,772 SF	$22 ($432K) - $41 ($811K)	$27 ($541K)
			Total			
				19,772 SF	$93 ($1.85M) - $175 ($3.46M)	$117 ($2.31M)
					Estimated Soft Costs:	$924K
					Total Estimated Project Costs:	**$3.23M**

W: Wood-Framed; URM: Unreinforced Masonry; RM: Reinforced Masonry; C: Reinforced Concrete; PC: Precast concrete; S: Steel-framed

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Appendix A: ASCE 41 Tier 1 Screening Report

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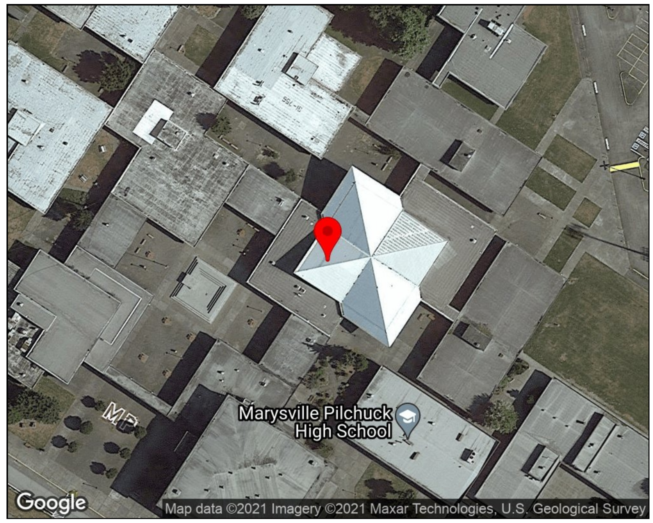
1. Marysville, Marysville Pilchuck Senior High School, Library - Bldg J

1.1 Building Description

Building Name:	Library - Bldg J
Facility Name:	Marysville Pilchuck Senior High School
District Name:	Marysville
ICOS Latitude:	48.095906
ICOS Longitude:	-122.155342
ICOS Building ID:	56244
ASCE 41 Bldg Type:	RM1
Enrollment:	1178
Gross Sq. Ft. :	19772
Year Built:	1970
Number of Stories:	1
S_{XS} BSE-2E:	0.959
S_{X1} BSE-2E:	0.584
ASCE 41 Level of Seismicity:	High
Site Class:	D
V_{S30}(m/s):	304
Liquefaction Potential:	low to moderate
Tsunami Risk:	No
Structural Drawings Available:	Yes
Evaluating Firm:	Reid Middleton, Inc.

** Liquification Potential and Tsunami Risk is based on publicly available state geologic hazard mapping.*



Building J at Marysville Pilchuck Senior High School is a single-story, 20,000 square foot masonry building and is the library building on this high school campus. The building was constructed in 1970 and has a footprint of approximately 165 feet by 165 feet. The building features a large volume library space with 16 to 28-foot tall exterior CMU walls and a vaulted roof consisting of glulam arches and girders that clear span 110 feet by 110 feet to the exterior walls. The library area is surrounded at the west and east corners by classroom, storage and office space with a lower flat roof. The areas around the library also have exterior stack bond concrete masonry walls and a wood framed roof.

1.1.1 Building Use

Building J serves as a Library for the high school. This building also has classroom, office and storage areas.

1.1.2 Structural System

Table 1-1. Structural System Description of Marysville Pilchuck Senior High School

Structural System	Description
Structural Roof	The roof framing consists of glulam members with wood joists spanning between them and CMU bearing walls. The roof framing system of both the low and high roofs are layered and consists of plywood sheathing supported by 2x3 flat stripping @ 24 inches on center, spanning over 2x joists that are supported by glulam girders that bear on CMU walls and piers.
Structural Floor(s)	The ground floor consists of a 3-1/2-inch concrete slab on grade. The elevated floor supporting 1,000 sf mechanical mezzanine consists of tongue and groove decking over wood joists supported by glulam beams and wood stud walls.
Foundations	The foundation consists of conventional spread footings with continuous footings under CMU and wood bearing walls and spread footings below CMU piers, pilasters, and columns.
Gravity System	The gravity system consists of wood roof framing supported by glulam girders, CMU bearing walls, pilasters, and columns that bear on conventional spread footings.
Lateral System	The lateral system consists of flexible wood roof diaphragms, glulam collectors, and concrete masonry shear walls.

1.1.3 Structural System Visual Condition

Table 1-2. Structural System Condition Description of Marysville Pilchuck Senior High School

Structural System	Description
Structural Roof	No visible deterioration or damage was observed.
Structural Floor(s)	No visible deterioration or damage was observed.
Foundations	No visible deterioration or damage was observed.
Gravity System	No visible deterioration or damage was observed.
Lateral System	No visible deterioration or damage was observed.

Figure 1-1. Building J, Southwest Corner

Figure 1-2. Building J, Northwest Corner

Figure 1-3. Building J, Northeast Corner

Figure 1-4. Building J, Southeast Corner

Figure 1-5. Building J, Typical Exterior CMU Column

Figure 1-6. Building J, Glulam Roof Framing

Figure 1-7. Building J, Overhead Glazing

Figure 1-8. Building J, Classroom Space

Figure 1-9. Building J, Light Fixtures Supported by Ceiling Grid

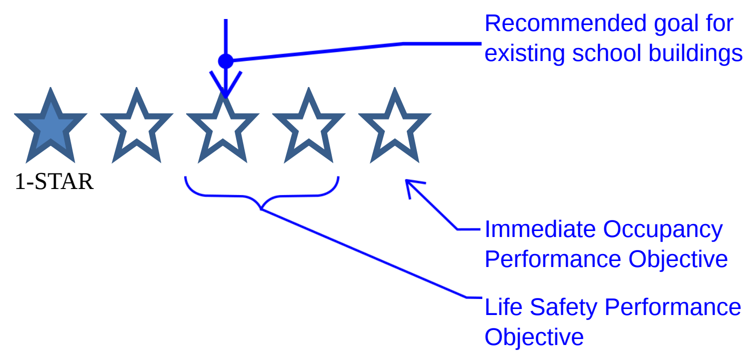
Figure 1-10. Building J, Roof Framing

1.1.4 Earthquake Performance Rating System - Structural Safety Rating

The seismic evaluation items from the ASCE 41 Tier 1 seismic evaluation checklist have been translated to a Structural Safety star-rating using the *EPRS ASCE 41-13 Translation Procedure*. There are two other safety sub-ratings using the EPRS *Translation Procedure*: a Geologic safety sub-rating and a Nonstructural safety sub-rating, that are not included below.

The structural safety star-rating below is a preliminary rating based on the information available for this study. The geologic checklist items have been excluded from the structural safety star-rating. If a building's structural safety star-rating is to be improved, it may also be necessary to further assess the geologic conditions of the building site. Determining the final star-rating of a building is intended to be an iterative process and preliminary ratings will often times be conservative until more field investigation, structural analysis, and engineering judgment is performed by a structural engineer. The intent in providing a preliminary star-rating as part of this study is to provide school districts with the action lists below to further improve the seismic performance and safety of the buildings that were assessed. The tables below indicate the Unknown (U) or Noncompliant (NC) structural seismic evaluation items that should be mitigated or further investigated to improve the Earthquake Performance Rating System (EPRS) structural safety rating for this building.

EPRS Structural Safety Rating for Marysville Pilchuck Senior High School, Library - Bldg J:



1-STAR 

Risk of Collapse in Multiple or Widespread Locations (Expected performance as a whole would lead to multiple or widespread conditions known to be associated with earthquake-related collapse resulting in injury, entrapment, or death.)

2-STAR 

Risk of Collapse in Isolated Locations (Expected performance in certain locations within or adjacent to the building would lead to conditions known to be associated with earthquake-related collapse resulting in injury, entrapment, or death.)

3-STAR 

Loss of Life Unlikely (Expected performance results in conditions that are unlikely to cause severe structural damage or loss of life). A 3-star rating meets the Tier 1 Life Safety (LS) structural performance objective.

4-STAR 

Serious Injuries Unlikely (Expected performance results in conditions that are associated with limited structural damage and are unlikely to cause serious injuries).

5-STAR 

Injuries and Entrapment Unlikely (Expected performance results in conditions that are associated with minimal structural damage and are unlikely to cause injuries or keep people from exiting the building). A 5-star rating meets the Tier 1 Immediate Occupancy (IO) structural performance objective.

Table 1-3. Identified Seismic Evaluation Items to Address for an improved 2-STAR Rating

Evaluation Item	Tier 1 Screening	Description
Wall Anchorage	Noncompliant	Anchorage is provided by girders that bear on the CMU walls and does not appear to be sufficient, especially at the tall walls of the library. Tension ties, blocking, strapping, mechanical connections of roof framing to the top of masonry walls, and roof diaphragm nailing and strengthening would be appropriate to mitigate seismic risk.
Transfer to Shear Walls	Noncompliant	The layered roof framing system does not provide direct or sufficient load path from the plywood roof sheathing diaphragm to the CMU shear walls. Additional blocking and connections to complete the load path from the plywood roof sheathing to the sill plate on top of the CMU wall would be appropriate to mitigate seismic risk.
Spans	Noncompliant	Diaphragms consist of plywood over 2x3 stripping at 24 inches on center spanning over 2x joists. The plywood is not directly attached to the joists supporting the 2x3 stripping and the drawings do not indicate how the stripping is attached to the joists. Diaphragm strengthening consisting of additional blocking and fasteners may be required mitigate hazards.
Diagonally Sheathed and Unblocked Diaphragms	Noncompliant	Diaphragm appears to be unblocked and has spans that exceed 40 feet. Diaphragms consist of plywood over 2x3 stripping at 24 inches on center spanning over 2x joists. Diaphragm strengthening with additional blocking and nailing may be required to mitigate hazard.

Note: All of the evaluation items in Table 3 need to be assessed as Compliant (C) in order to achieve a 2-Star Structural Safety Rating.

Table 1-4. Additional Seismic Evaluation Items to Mitigate or Further Investigate for an improved 3-STAR Rating

Evaluation Item	Tier 1 Evaluation	Description
Adjacent Buildings	Noncompliant	Joint between the building being evaluated and the adjacent building is approximately 2 inches wide and does not appear to be adequately sized for the movement of the Library building and the adjacent classrooms towards each other. Further investigation should be performed to determine the width required to avoid the roofs of the building hitting each other during a seismic event.
Reinforcing Steel	Noncompliant	The existing drawings indicate that the CMU walls are vertically reinforced with #6 at 48 inches on center and horizontally reinforced with k-web joint reinforcing at 16 inches on center. The horizontal joint reinforcing results in a reinforcing steel ratio that is less than 0.0007. Depending on whether the wall is solidly grouted or not, the reinforcing may also not meet the 0.002 total reinforcing ratio.

Note: Tables 3 and 4 are cumulative. All of the evaluation items in Table 4 need to be assessed as Compliant (C) in addition to all of the evaluation items in Table 3 being assessed as Compliant (C), in order to achieve a 3-Star Structural Safety Rating.

The Structural Safety star-rating contained in this report is based on ASCE 41 Tier 1 Screening Checklists only. These seismic screening checklists are often the first step employed by structural engineers when trying to determine the seismic vulnerabilities of existing buildings and to begin a process of mitigating these seismic vulnerabilities. School district facilities management personnel and their design consultants should be able to take advantage of this information to help inform and address seismic risks in existing or future renovation, repair, or modernization projects.

It is important to note that information used for these school seismic screenings was limited to available construction drawings and limited site observations by our team of licensed structural engineers. In some cases, construction drawings were not available for review. Due to the limited scope of the study, our team of engineers were not able to perform more-detailed investigations above ceilings, behind wall finishes, in confined spaces, or in other areas obstructed from view. In many cases, further investigation and engineering analysis may find that items marked as unknown or noncompliant may not require seismic mitigation if it is shown that the existing structure is acceptable in its current state. In these cases, further investigation and engineering analysis should be conducted ahead of a seismic upgrade construction project, especially when a building is marked as having many unknown items.

1.2 Seismic Evaluation Findings

1.2.1 Structural Seismic Deficiencies

The structural seismic deficiencies identified during the Tier 1 evaluation are summarized below. Commentary for each deficiency is also provided based on this evaluation.

Table 1-5. Identified Structural Seismic Deficiencies for Marysville Marysville Pilchuck Senior High School Library - Bldg J

Deficiency	Description
Adjacent Buildings	Joint between the building being evaluated and the adjacent building is approximately 2 inches wide and does not appear to be adequately sized for the movement of the Library building and the adjacent classrooms towards each other. Further investigation should be performed to determine the width required to avoid the roofs of the building hitting each other during a seismic event.
Reinforcing Steel	The existing drawings indicate that the CMU walls are vertically reinforced with #6 at 48 inches on center and horizontally reinforced with k-web joint reinforcing at 16 inches on center. The horizontal joint reinforcing results in a reinforcing steel ratio that is less than 0.0007. Depending on whether the wall is solidly grouted or not, the reinforcing may also not meet the 0.002 total reinforcing ratio.
Wall Anchorage	Anchorage is provided by girders that bear on the CMU walls and does not appear to be sufficient, especially at the tall walls of the library. Tension ties, blocking, strapping, mechanical connections of roof framing to the top of masonry walls, and roof diaphragm nailing and strengthening would be appropriate to mitigate seismic risk.
Transfer to Shear Walls	The layered roof framing system does not provide direct or sufficient load path from the plywood roof sheathing diaphragm to the CMU shear walls. Additional blocking and connections to complete the load path from the plywood roof sheathing to the sill plate on top of the CMU wall would be appropriate to mitigate seismic risk.
Spans	Diaphragms consist of plywood over 2x3 stripping at 24 inches on center spanning over 2x joists. The plywood is not directly attached to the joists supporting the 2x3 stripping and the drawings do not indicate how the stripping is attached to the joists. Diaphragm strengthening consisting of additional blocking and fasteners may be required mitigate hazards.
Diagonally Sheathed and Unblocked Diaphragms	Diaphragm appears to be unblocked and has spans that exceed 40 feet. Diaphragms consist of plywood over 2x3 stripping at 24 inches on center spanning over 2x joists. Diaphragm strengthening with additional blocking and nailing may be required to mitigate hazard.

1.2.2 Structural Checklist Items Marked as Unknown

Where building structural component seismic adequacy was unknown due to lack of available information or limited observation, the structural checklist items were marked as “unknown”. These items require further investigation if definitive determination of compliance or noncompliance is desired. The unknown structural checklist items identified during the Tier 1 evaluation are summarized below. Commentary for each unknown item is also provided based on the evaluation.

Table 1-6. Identified Structural Checklist Items Marked as Unknown for Marysville Marysville Pilchuck Senior High School Library - Bldg J

Unknown Item	Description
Liquefaction	The liquefaction potential of site soils is unknown at this time given available information. low to moderate liquefaction potential is identified per ICOS based on state geologic mapping. Requires further investigation by a licensed geotechnical engineer to determine liquefaction potential.
Slope Failure	Requires further investigation by a licensed geotechnical engineer to determine susceptibility to slope failure. The structure appears to be located on a relatively flat site.
Surface Fault Rupture	Requires further investigation by a licensed geotechnical engineer to determine whether site is near locations of expected surface fault ruptures.

1.3.1 Nonstructural Seismic Deficiencies

The nonstructural seismic deficiencies identified during the Tier 1 evaluation are summarized below. Commentary for each deficiency is also provided based on this evaluation. Some nonstructural deficiencies may be able to be mitigated by school district staff. Other nonstructural components that require more substantial mitigation may be more appropriately included in a long-term mitigation strategy. Some typical conceptual details for the seismic upgrade of nonstructural components can be found in the FEMA E-74 Excerpts appendix.

Table 1-7. Identified Nonstructural Seismic Deficiencies for Marysville Marysville Pilchuck Senior High School Library - Bldg J

Deficiency	Description
CG-8 Overhead Glazing. HR-not required; LS-MH; PR-MH.	Large overhead glazing at the east corner of the library likely does not contain laminated glass given the age of the windows. A laminating security film could be added to keep the glass from shattering and mitigate the seismic risk of sharp falling hazards.

1.3.2 Nonstructural Checklist Items Marked as Unknown

Where building nonstructural component seismic adequacy was unknown due to lack of available information or limited observation, the nonstructural checklist items were marked as "unknown". These items require further investigation if definitive determination of compliance or noncompliance is desired. The unknown nonstructural checklist items identified during the Tier 1 evaluation are summarized below. Commentary for each unknown item is also provided based on the evaluation.

Some nonstructural deficiencies may be able to be mitigated by school district staff. Other nonstructural components that require more substantial mitigation may be more appropriately included in a long-term mitigation strategy. Some typical conceptual details for the seismic upgrade of nonstructural components can be found in the FEMA E-74 Excerpts appendix.

Table 1-8. Identified Nonstructural Checklist Items Marked as Unknown for Marysville Marysville Pilchuck Senior High School Library - Bldg J

Unknown Item	Description
HM-3 Hazardous Material Distribution. HR-MH; LS-MH; PR-MH.	No existing drawings and inadequate access to verify. Further investigation should be performed.
HM-4 Shutoff Valves. HR-MH; LS-MH; PR-MH.	No existing drawings and inadequate access to verify. Further investigation should be performed.
HM-5 Flexible Couplings. HR-LMH; LS-LMH; PR-LMH.	No existing drawings and inadequate access to verify. Further investigation should be performed.
HM-6 Piping or Ducts Crossing Seismic Joints. HR-MH; LS-MH; PR-MH.	
C-2 Suspended Gypsum Board. HR-not required; LS-MH; PR-LMH.	Exterior soffits under the cantilevered roof are GWB or wood sheathing panels suspended below the roof framing. Areas adjacent to or surrounding building exits should be further investigated or removed and replaced to mitigate the risk of become a falling hazard or obstruction.
LF-1 Independent Support. HR-not required; LS-MH; PR-MH.	Limited areas of ACT ceilings were accessible and observed. Further investigation can and should be performed by maintenance staff in other areas with ACT or suspended grid ceilings.
CF-2 Tall Narrow Contents. HR-not required; LS-H; PR-MH.	Due to time constraints and ongoing school operations in the library, tops of bookshelves could not be checked to see that their tops were restrained to the backing walls. Further investigation should be performed and restraint clips added if they bookshelves are not secured tot he backing walls.
ME-2 In-Line Equipment. HR-not required; LS-H; PR-H.	No existing drawings and inadequate access to verify. Further investigation should be performed.

Marysville, Marysville Pilchuck Senior High School, Library - Bldg J

17-2 Collapse Prevention Basic Configuration Checklist

Building record drawings have been reviewed, when available, and a non-destructive field investigation has been performed for the subject building. Each of the required checklist items are marked Compliant (C), Noncompliant (NC), Not Applicable (N/A), or Unknown (U). Items marked Compliant indicate conditions that satisfy the performance objective, whereas items marked Noncompliant or Unknown indicate conditions that do not. Certain statements might not apply to the building being evaluated.

Low Seismicity

Building System - General

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Load Path	The structure contains a complete, well-defined load path, including structural elements and connections, that serves to transfer the inertial forces associated with the mass of all elements of the building to the foundation. (Tier 2: Sec. 5.4.1.1; Commentary: Sec. A.2.1.10)	X				
Adjacent Buildings	The clear distance between the building being evaluated and any adjacent building is greater than 0.25% of the height of the shorter building in low seismicity, 0.5% in moderate seismicity, and 1.5% in high seismicity. (Tier 2: Sec. 5.4.1.2; Commentary: Sec. A.2.1.2)		X			Joint between the building being evaluated and the adjacent building is approximately 2 inches wide and does not appear to be adequately sized for the movement of the Library building and the adjacent classrooms towards each other. Further investigation should be performed to determine the width required to avoid the roofs of the building hitting each other during a seismic event.
Mezzanines	Interior mezzanine levels are braced independently from the main structure or are anchored to the seismic-force-resisting elements of the main structure. (Tier 2: Sec. 5.4.1.3; Commentary: Sec. A.2.1.3)	X				

Building System - Building Configuration

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Weak Story	The sum of the shear strengths of the seismic-force-resisting system in any story in each direction is not less than 80% of the strength in the adjacent story above. (Tier 2: Sec. 5.4.2.1; Commentary: Sec. A.2.2.2)			X		

Soft Story	The stiffness of the seismic-force-resisting system in any story is not less than 70% of the seismic-force-resisting system stiffness in an adjacent story above or less than 80% of the average seismic-force-resisting system stiffness of the three stories above. (Tier 2: Sec. 5.4.2.2; Commentary: Sec. A.2.2.3)			X		
Vertical Irregularities	All vertical elements in the seismic-force-resisting system are continuous to the foundation. (Tier 2: Sec. 5.4.2.3; Commentary: Sec. A.2.2.4)	X				
Geometry	There are no changes in the net horizontal dimension of the seismic-force-resisting system of more than 30% in a story relative to adjacent stories, excluding one-story penthouses and mezzanines. (Tier 2: Sec. 5.4.2.4; Commentary: Sec. A.2.2.5)			X		
Mass	There is no change in effective mass of more than 50% from one story to the next. Light roofs, penthouses, and mezzanines need not be considered. (Tier 2: Sec. 5.4.2.5; Commentary: Sec. A.2.2.6)			X		
Torsion	The estimated distance between the story center of mass and the story center of rigidity is less than 20% of the building width in either plan dimension. (Tier 2: Sec. 5.4.2.6; Commentary: Sec. A.2.2.7)			X		

Moderate Seismicity **(Complete the Following Items in Addition to the Items for Low Seismicity)**

Geologic Site Hazards

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Liquefaction	Liquefaction-susceptible, saturated, loose granular soils that could jeopardize the building's seismic performance do not exist in the foundation soils at depths within 50 ft (15.2 m) under the building. (Tier 2: Sec. 5.4.3.1; Commentary: Sec. A.6.1.1)				X	The liquefaction potential of site soils is unknown at this time given available information. low to moderate liquefaction potential is identified per ICOS based on state geologic mapping. Requires further investigation by a licensed geotechnical engineer to determine liquefaction potential.

Slope Failure	The building site is located away from potential earthquake-induced slope failures or rockfalls so that it is unaffected by such failures or is capable of accommodating any predicted movements without failure. (Tier 2: Sec. 5.4.3.1; Commentary: Sec. A.6.1.2)				X	Requires further investigation by a licensed geotechnical engineer to determine susceptibility to slope failure. The structure appears to be located on a relatively flat site.
Surface Fault Rupture	Surface fault rupture and surface displacement at the building site are not anticipated. (Tier 2: Sec. 5.4.3.1; Commentary: Sec. A.6.1.3)				X	Requires further investigation by a licensed geotechnical engineer to determine whether site is near locations of expected surface fault ruptures.

High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)

Foundation Configuration

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Overturning	The ratio of the least horizontal dimension of the seismic-force-resisting system at the foundation level to the building height (base/height) is greater than 0.6Sa. (Tier 2: Sec. 5.4.3.3; Commentary: Sec. A.6.2.1)	X				
Ties Between Foundation Elements	The foundation has ties adequate to resist seismic forces where footings, piles, and piers are not restrained by beams, slabs, or soils classified as Site Class A, B, or C. (Tier 2: Sec. 5.4.3.4; Commentary: Sec. A.6.2.2)	X				

17-34 Collapse Prevention Structural Checklist for Building Types RM1 and RM2

Building record drawings have been reviewed, when available, and a non-destructive field investigation has been performed for the subject building. Each of the required checklist items are marked Compliant (C), Noncompliant (NC), Not Applicable (N/A), or Unknown (U). Items marked Compliant indicate conditions that satisfy the performance objective, whereas items marked Noncompliant or Unknown indicate conditions that do not. Certain statements might not apply to the building being evaluated.

Low and Moderate Seismicity

Seismic-Force-Resisting System

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Redundancy	The number of lines of shear walls in each principal direction is greater than or equal to 2. (Tier 2: Sec. 5.5.1.1; Commentary: Sec. A.3.2.1.1)	X				
Shear Stress Check	The shear stress in the reinforced masonry shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than 70 lb/in.2 (0.48 MPa). (Tier 2: Sec. 5.5.3.1.1; Commentary: Sec. A.3.2.4.1)	X				
Reinforcing Steel	The total vertical and horizontal reinforcing steel ratio in reinforced masonry walls is greater than 0.002 of the wall with the minimum of 0.0007 in either of the two directions; the spacing of reinforcing steel is less than 48 in. (1220 mm), and all vertical bars extend to the top of the walls. (Tier 2: Sec. 5.5.3.1.3; Commentary: Sec. A.3.2.4.2)		X			The existing drawings indicate that the CMU walls are vertically reinforced with #6 at 48 inches on center and horizontally reinforced with k-web joint reinforcing at 16 inches on center. The horizontal joint reinforcing results in a reinforcing steel ratio that is less than 0.0007. Depending on whether the wall is solidly grouted or not, the reinforcing may also not meet the 0.002 total reinforcing ratio.

Stiff Diaphragms

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Topping Slab	Precast concrete diaphragm elements are interconnected by a continuous reinforced concrete topping slab. (Tier 2: Sec. 5.6.4; Commentary: Sec. A.4.5.1)			X		

Connections

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT

Wall Anchorage	Exterior concrete or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7. (Tier 2: Sec. 5.7.1.1; Commentary: Sec. A.5.1.1)		X			Anchorage is provided by girders that bear on the CMU walls and does not appear to be sufficient, especially at the tall walls of the library. Tension ties, blocking, strapping, mechanical connections of roof framing to the top of masonry walls, and roof diaphragm nailing and strengthening would be appropriate to mitigate seismic risk.
Wood Ledgers	The connection between the wall panels and the diaphragm does not induce cross-grain bending or tension in the wood ledgers. (Tier 2: Sec. 5.7.1.3; Commentary: Sec. A.5.1.2)			X		
Transfer to Shear Walls	Diaphragms are connected for transfer of seismic forces to the shear walls. (Tier 2: Sec. 5.7.2; Commentary: Sec. A.5.2.1)		X			The layered roof framing system does not provide direct or sufficient load path from the plywood roof sheathing diaphragm to the CMU shear walls. Additional blocking and connections to complete the load path from the plywood roof sheathing to the sill plate on top of the CMU wall would be appropriate to mitigate seismic risk.
Topping Slab to Walls or Frames	Reinforced concrete topping slabs that interconnect the precast concrete diaphragm elements are doweled for transfer of forces into the shear wall or frame elements. (Tier 2: Sec. 5.7.2; Commentary: Sec. A.5.2.)			X		
Foundation Dowels	Wall reinforcement is doweled into the foundation. (Tier 2: Sec. 5.7.3.4; Commentary: Sec. A.5.3.5)	X				
Girder-Column Connection	There is a positive connection using plates, connection hardware, or straps between the girder and the column support. (Tier 2: Sec. 5.7.4.1; Commentary: Sec. A.5.4.1)	X				

High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)

Stiff Diaphragms

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Openings at Shear Walls	Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length. (Tier 2: Sec. 5.6.1.3; Commentary: Sec. A.4.1.4)			X		
Openings at Exterior Masonry Shear Walls	Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft (2.4 m) long. (Tier 2: Sec. 5.6.1.3; Commentary: Sec. A.4.1.6)			X		

Flexible Diaphragms

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Cross Ties	There are continuous cross ties between diaphragm chords. (Tier 2: Sec. 5.6.1.2; Commentary: Sec. A.4.1.2)	X				
Openings at Shear Walls	Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length. (Tier 2: Sec. 5.6.1.3; Commentary: Sec. A.4.1.4)	X				
Openings at Exterior Masonry Shear Walls	Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft (2.4 m) long. (Tier 2: Sec. 5.6.1.3; Commentary: Sec. A.4.1.6)	X				
Straight Sheathing	All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered. (Tier 2: Sec. 5.6.2; Commentary: Sec. A.4.2.1)	X				Applicable at mezzanine floor only.
Spans	All wood diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels or diagonal sheathing. (Tier 2: Sec. 5.6.2; Commentary: Sec. A.4.2.2)		X			Diaphragms consist of plywood over 2x3 stripping at 24 inches on center spanning over 2x joists. The plywood is not directly attached to the joists supporting the 2x3 stripping and the drawings do not indicate how the stripping is attached to the joists. Diaphragm strengthening consisting of additional blocking and fasteners may be required mitigate hazards.

Diagonally Sheathed and Unblocked Diaphragms	All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and aspect ratios less than or equal to 4 to-1. (Tier 2: Sec. 5.6.2; Commentary: Sec. A.4.2.3)		X			Diaphragm appears to be unblocked and has spans that exceed 40 feet. Diaphragms consist of plywood over 2x3 stripping at 24 inches on center spanning over 2x joists. Diaphragm strengthening with additional blocking and nailing may be required to mitigate hazard.
Other Diaphragms	Diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing. (Tier 2: Sec. 5.6.5; Commentary: Sec. A.4.7.1)	X				

Connections

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Stiffness of Wall Anchors	Anchors of concrete or masonry walls to wood structural elements are installed taut and are stiff enough to limit the relative movement between the wall and the diaphragm to no greater than 1/8 in. (3 mm) before engagement of the anchors. (Tier 2: Sec. 5.7.1.2; Commentary: Sec. A.5.1.4)	X				

Marysville, Marysville Pilchuck Senior High School, Library - Bldg J

17-38 Nonstructural Checklist

Notes:
C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.
Performance Level: HR = Hazards Reduced, LS = Life Safety, and PR = Position Retention.
Level of Seismicity: L = Low, M = Moderate, and H = High

Life Safety Systems

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
LSS-1 Fire Suppression Piping. HR-not required; LS-LMH; PR-LMH.	Fire suppression piping is anchored and braced in accordance with NFPA-13. (Tier 2: Sec. 13.7.4; Commentary: Sec. A.7.13.1)			X		
LSS-2 Flexible Couplings. HR-not required; LS-LMH; PR-LMH.	Fire suppression piping has flexible couplings in accordance with NFPA-13. (Tier 2: Sec. 13.7.4; Commentary: Sec. A.7.13.2)			X		
LSS-3 Emergency Power. HR-not required; LS-LMH; PR-LMH.	Equipment used to power or control Life Safety systems is anchored or braced. (Tier 2: Sec. 13.7.7; Commentary: Sec. A.7.12.1)			X		
LSS-4 Stair and Smoke Ducts. HR-not required; LS-LMH; PR-LMH.	Stair pressurization and smoke control ducts are braced and have flexible connections at seismic joints. (Tier 2: Sec. 13.7.6; Commentary: Sec. A.7.14.1)			X		
LSS-5 Sprinkler Ceiling Clearance. HR-not required; LS-MH; PR-MH.	Penetrations through panelized ceilings for fire suppression devices provide clearances in accordance with NFPA-13. (Tier 2: Sec. 13.7.4; Commentary: Sec. A.7.13.3)			X		
LSS-6 Emergency Lighting. HR-not required; LS-not required; PR-LMH	Emergency and egress lighting equipment is anchored or braced. (Tier 2: Sec. 13.7.9; Commentary: Sec. A.7.3.1)			X		

Hazardous Materials

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
HM-1 Hazardous Material Equipment. HR-LMH; LS-LMH; PR-LMH.	Equipment mounted on vibration isolators and containing hazardous material is equipped with restraints or snubbers. (Tier 2: Sec. 13.7.1; Commentary: Sec. A.7.12.2)			X		
HM-2 Hazardous Material Storage. HR-LMH; LS-LMH; PR-LMH.	Breakable containers that hold hazardous material, including gas cylinders, are restrained by latched doors, shelf lips, wires, or other methods. (Tier 2: Sec. 13.8.3; Commentary: Sec. A.7.15.1)			X		
HM-3 Hazardous Material Distribution. HR-MH; LS-MH; PR-MH.	Piping or ductwork conveying hazardous materials is braced or otherwise protected from damage that would allow hazardous material release. (Tier 2: Sec. 13.7.3, 13.7.5; Commentary: Sec. A.7.13.4)				X	No existing drawings and inadequate access to verify. Further investigation should be performed.

HM-4 Shutoff Valves. HR-MH; LS-MH; PR-MH.	Piping containing hazardous material, including natural gas, has shutoff valves or other devices to limit spills or leaks. (Tier 2: Sec. 13.7.3, 13.7.5; Commentary: Sec. A.7.13.3)				X	No existing drawings and inadequate access to verify. Further investigation should be performed.
HM-5 Flexible Couplings. HR-LMH; LS-LMH; PR-LMH.	Hazardous material ductwork and piping, including natural gas piping, have flexible couplings. (Tier 2: Sec. 13.7.3, 13.7.5; Commentary: Sec. A.7.15.4)				X	No existing drawings and inadequate access to verify. Further investigation should be performed.
HM-6 Piping or Ducts Crossing Seismic Joints. HR-MH; LS-MH; PR-MH.	Piping or ductwork carrying hazardous material that either crosses seismic joints or isolation planes or is connected to independent structures has couplings or other details to accommodate the relative seismic displacements. (Tier 2: Sec. 13.7.3, 13.7.5, 13.7.6; Commentary: Sec. A.7.13.6)				X	No existing drawings and inadequate access to verify. Further investigation should be performed.

Partitions

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
P-1 Unreinforced Masonry. HR-LMH; LS-LMH; PR-LMH.	Unreinforced masonry or hollow-clay tile partitions are braced at a spacing of at most 10 ft (3.0 m) in Low or Moderate Seismicity, or at most 6 ft (1.8 m) in High Seismicity. (Tier 2: Sec. 13.6.2; Commentary: Sec. A.7.1.1)			X		
P-2 Heavy Partitions Supported by Ceilings. HR-LMH; LS-LMH; PR-LMH.	The tops of masonry or hollow-clay tile partitions are not laterally supported by an integrated ceiling system. (Tier 2: Sec. 13.6.2; Commentary: Sec. A.7.2.1)			X		
P-3 Drift. HR-not required; LS-MH; PR-MH.	Rigid cementitious partitions are detailed to accommodate the following drift ratios: in steel moment frame, concrete moment frame, and wood frame buildings, 0.02; in other buildings, 0.005. (Tier 2: Sec. 13.6.2; Commentary: Sec. A.7.1.2)			X		
P-4 Light Partitions Supported by Ceilings. HR-not required; LS-not required; PR-MH.	The tops of gypsum board partitions are not laterally supported by an integrated ceiling system. (Tier 2: Sec. 13.6.2; Commentary: Sec. A.7.2.1)			X		
P-5 Structural Separations. HR-not required; LS-not required; PR-MH.	Partitions that cross structural separations have seismic or control joints. (Tier 2: Sec. 13.6.2; Commentary: Sec. A.7.1.3)			X		
P-6 Tops. HR-not required; LS-not required; PR-MH.	The tops of ceiling-high framed or panelized partitions have lateral bracing to the structure at a spacing equal to or less than 6 ft (1.8 m). (Tier 2: Sec. 13.6.2; Commentary: Sec. A.7.1.4)			X		

Ceilings

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
C-1 Suspended Lath and Plaster. HR-H; LS-MH; PR-LMH.	Suspended lath and plaster ceilings have attachments that resist seismic forces for every 12 ft2 (1.1 m2) of area. (Tier 2: Sec. 13.6.4; Commentary: Sec. A.7.2.3)			X		
C-2 Suspended Gypsum Board. HR-not required; LS-MH; PR-LMH.	Suspended gypsum board ceilings have attachments that resist seismic forces for every 12 ft2 (1.1 m2) of area. (Tier 2: Sec. 13.6.4; Commentary: Sec. A.7.2.3)				X	Exterior soffits under the cantilevered roof are GWB or wood sheathing panels suspended below the roof framing. Areas adjacent to or surrounding building exits should be further investigated or removed and replaced to mitigate the risk of become a falling hazard or obstruction.
C-3 Integrated Ceilings. HR-not required; LS-not required; PR-MH.	Integrated suspended ceilings with continuous areas greater than 144 ft2 (13.4 m2) and ceilings of smaller areas that are not surrounded by restraining partitions are laterally restrained at a spacing no greater than 12 ft (3.6 m) with members attached to the structure above. Each restraint location has a minimum of four diagonal wires and compression struts, or diagonal members capable of resisting compression. (Tier 2: Sec. 13.6.4; Commentary: Sec. A.7.2.2)			X		
C-4 Edge Clearance. HR-not required; LS-not required; PR-MH.	The free edges of integrated suspended ceilings with continuous areas greater than 144 ft2 (13.4 m2) have clearances from the enclosing wall or partition of at least the following: in Moderate Seismicity, 1/2 in. (13 mm); in High Seismicity, 3/4 in. (19 mm). (Tier 2: Sec. 13.6.4; Commentary: Sec. A.7.2.4)			X		
C-5 Continuity Across Structure Joints. HR-not required; LS-not required; PR-MH.	The ceiling system does not cross any seismic joint and is not attached to multiple independent structures. (Tier 2: Sec. 13.6.4; Commentary: Sec. A.7.2.5)			X		
C-6 Edge Support. HR-not required; LS-not required; PR-H.	The free edges of integrated suspended ceilings with continuous areas greater than 144 ft2 (13.4 m2) are supported by closure angles or channels not less than 2 in. (51 mm) wide. (Tier 2: Sec. 13.6.4 ; Commentary: Sec. A.7.2.6)			X		

C-7 Seismic Joints. HR-not required; LS-not required; PR-H.	Acoustical tile or lay-in panel ceilings have seismic separation joints such that each continuous portion of the ceiling is no more than 2,500 ft2 (232.3 m2) and has a ratio of long-to-short dimension no more than 4-to-1. (Tier 2: Sec. 13.6.4; Commentary: Sec. A.7.2.7)			X		

Light Fixtures

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
LF-1 Independent Support. HR-not required; LS-MH; PR-MH.	Light fixtures that weigh more per square foot than the ceiling they penetrate are supported independent of the grid ceiling suspension system by a minimum of two wires at diagonally opposite corners of each fixture. (Tier 2: Sec. 13.6.4, 13.7.9; Commentary: Sec. A.7.3.2)				X	Limited areas of ACT ceilings were accessible and observed. Further investigation can and should be performed by maintenance staff in other areas with ACT or suspended grid ceilings.
LF-2 Pendant Supports. HR-not required; LS-not required; PR-H.	Light fixtures on pendant supports are attached at a spacing equal to or less than 6 ft. Unbraced suspended fixtures are free to allow a 360-degree range of motion at an angle not less than 45 degrees from horizontal without contacting adjacent components. Alternatively, if rigidly supported and/or braced, they are free to move with the structure to which they are attached without damaging adjoining components. Additionally, the connection to the structure is capable of accommodating the movement without failure. (Tier 2: Sec. 13.7.9; Commentary: Sec. A.7.3.3)			X		
LF-3 Lens Covers. HR-not required; LS-not required; PR-H.	Lens covers on light fixtures are attached with safety devices. (Tier 2: Sec. 13.7.9; Commentary: Sec. A.7.3.4)			X		

Cladding and Glazing

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
CG-1 Cladding Anchors. HR-MH; LS-MH; PR-MH.	Cladding components weighing more than 10 lb/ft2 (0.48 kN/m2) are mechanically anchored to the structure at a spacing equal to or less than the following: for Life Safety in Moderate Seismicity, 6 ft (1.8 m); for Life Safety in High Seismicity and for Position Retention in any seismicity, 4 ft (1.2 m) (Tier 2: Sec. 13.6.1; Commentary: Sec. A.7.4.1)			X		

CG-2 Cladding Isolation. HR-not required; LS-MH; PR-MH.	For steel or concrete moment-frame buildings, panel connections are detailed to accommodate a story drift ratio by the use of rods attached to framing with oversize holes or slotted holes of at least the following: for Life Safety in Moderate Seismicity, 0.01; for Life Safety in High Seismicity and for Position Retention in any seismicity, 0.02, and the rods have a length-to-diameter ratio of 4.0 or less. (Tier 2: Sec. 13.6.1; Commentary: Sec. A.7.4.3)			X		
CG-3 Multi-Story Panels. HR-MH; LS-MH; PR-MH.	For multi-story panels attached at more than one floor level, panel connections are detailed to accommodate a story drift ratio by the use of rods attached to framing with oversize holes or slotted holes of at least the following: for Life Safety in Moderate Seismicity, 0.01; for Life Safety in High Seismicity and for Position Retention in any seismicity, 0.02, and the rods have a length-to-diameter ratio of 4.0 or less. (Tier 2: Sec. 13.6.1; Commentary: Sec. A.7.4.4)			X		
CG-4 Threaded Rods. HR-not required; LS-MH; PR-MH.	Threaded rods for panel connections detailed to accommodate drift by bending of the rod have a length-to-diameter ratio greater than 0.06 times the story height in inches for Life Safety in Moderate Seismicity and 0.12 times the story height in inches for Life Safety in High Seismicity and Position Retention in any seismicity. (Tier 2: Sec. 13.6.1; Commentary: Sec. A.7.4.9)			X		
CG-5 Panel Connections. HR-MH; LS-MH; PR-MH.	Cladding panels are anchored out of plane with a minimum number of connections for each wall panel, as follows: for Life Safety in Moderate Seismicity, 2 connections; for Life Safety in High Seismicity and for Position Retention in any seismicity, 4 connections. (Tier 2: Sec. 13.6.1.4; Commentary: Sec. A.7.4.5)			X		
CG-6 Bearing Connections. HR-MH; LS-MH; PR-MH.	Where bearing connections are used, there is a minimum of two bearing connections for each cladding panel. (Tier 2: Sec. 13.6.1.4; Commentary: Sec. A.7.4.6)			X		
CG-7 Inserts. HR-MH; LS-MH; PR-MH.	Where concrete cladding components use inserts, the inserts have positive anchorage or are anchored to reinforcing steel. (Tier 2: Sec. 13.6.1.4; Commentary: Sec. A.7.4.7)			X		

CG-8 Overhead Glazing. HR-not required; LS-MH; PR-MH.	Glazing panes of any size in curtain walls and individual interior or exterior panes more than 16 ft2 (1.5 m2) in area are laminated annealed or laminated heat-strengthened glass and are detailed to remain in the frame when cracked. (Tier 2: Sec. 13.6.1.5; Commentary: Sec. A.7.4.8)		X			Large overhead glazing at the east corner of the library likely does not contain laminated glass given the age of the windows. A laminating security film could be added to keep the glass from shattering and mitigate the seismic risk of sharp falling hazards.

Masonry Veneer

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
M-1 Ties. HR-not required; LS-LMH; PR-LMH.	Masonry veneer is connected to the backup with corrosion-resistant ties. There is a minimum of one tie for every 2-2/3 ft2 (0.25 m2), and the ties have spacing no greater than the following: for Life Safety in Low or Moderate Seismicity, 36 in. (914 mm); for Life Safety in High Seismicity and for Position Retention in any seismicity, 24 in. (610 mm). (Tier 2: Sec. 13.6.1.2; Commentary: Sec. A.7.5.1)			X		
M-2 Shelf Angles. HR-not required; LS-LMH; PR-LMH.	Masonry veneer is supported by shelf angles or other elements at each floor above the ground floor. (Tier 2: Sec. 13.6.1.2; Commentary: Sec. A.7.5.2)			X		
M-3 Weakened Planes. HR-not required; LS-LMH; PR-LMH.	Masonry veneer is anchored to the backup adjacent to weakened planes, such as at the locations of flashing. (Tier 2: Sec. 13.6.1.2; Commentary: Sec. A.7.5.3)			X		
M-4 Unreinforced Masonry Backup. HR-LMH; LS-LMH; PR-LMH.	There is no unreinforced masonry backup. (Tier 2: Sec. 13.6.1.1, 13.6.1.2; Commentary: Sec. A.7.7.2)			X		
M-5 Stud Tracks. HR-not required; LS-MH; PR-MH.	For veneer with coldformed steel stud backup, stud tracks are fastened to the structure at a spacing equal to or less than 24 in. (610 mm) on center. (Tier 2: Sec. 13.6.1.1, 13.6.1.2; Commentary: Sec. A.7.6.)			X		
M-6 Anchorage. HR-not required; LS-MH; PR-MH.	For veneer with concrete block or masonry backup, the backup is positively anchored to the structure at a horizontal spacing equal to or less than 4 ft along the floors and roof. (Tier 2: Sec. 13.6.1.1, 13.6.1.2; Commentary: Sec. A.7.7.1)			X		
M-7 Weep Holes. HR-not required; LS-not required; PR-MH.	In veneer anchored to stud walls, the veneer has functioning weep holes and base flashing. (Tier 2: Sec. 13.6.1.2; Commentary: Sec. A.7.5.6)			X		

M-8 Openings. HR-not required; LS-not required; PR-MH.	For veneer with cold-formed-steel stud backup, steel studs frame window and door openings. (Tier 2: Sec. 13.6.1.1, 13.6.1.2; Commentary: Sec. A.7.6.2)			X		

Parapets, Cornices, Ornamentation, and Appendages

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
PCOA-1 URM Parapets or Cornices. HR-LMH; LS-LMH; PR-LMH.	Laterally unsupported unreinforced masonry parapets or cornices have height-tothickness ratios no greater than the following: for Life Safety in Low or Moderate Seismicity, 2.5; for Life Safety in High Seismicity and for Position Retention in any seismicity, 1.5. (Tier 2: Sec. 13.6.5; Commentary: Sec. A.7.8.1)			X		
PCOA-2 Canopies. HR-not required; LS-LMH; PR-LMH.	Canopies at building exits are anchored to the structure at a spacing no greater than the following: for Life Safety in Low or Moderate Seismicity, 10 ft (3.0 m); for Life Safety in High Seismicity and for Position Retention in any seismicity, 6 ft (1.8 m). (Tier 2: Sec. 13.6.6; Commentary: Sec. A.7.8.2)			X		
PCOA-3 Concrete Parapets. HR-H; LS-MH; PR-LMH.	Concrete parapets with height-to-thickness ratios greater than 2.5 have vertical reinforcement. (Tier 2: Sec. 13.6.5; Commentary: Sec. A.7.8.3)			X		
PCOA-4 Appendages. HR-MH; LS-MH; PR-LMH.	Cornices, parapets, signs, and other ornamentation or appendages that extend above the highest point of anchorage to the structure or cantilever from components are reinforced and anchored to the structural system at a spacing equal to or less than 6 ft (1.8 m). This evaluation statement item does not apply to parapets or cornices covered by other evaluation statements. (Tier 2: Sec. 13.6.6; Commentary: Sec. A.7.8.4)			X		

Masonry Chimneys

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
MC-1 URM Chimneys. HR-LMH; LS-LMH; PR-LMH.	Unreinforced masonry chimneys extend above the roof surface no more than the following: for Life Safety in Low or Moderate Seismicity, 3 times the least dimension of the chimney; for Life Safety in High Seismicity and for Position Retention in any seismicity, 2 times the least dimension of the chimney. (Tier 2: Sec. 13.6.7; Commentary: Sec. A.7.9.1)			X		
MC-2 Anchorage. HR-LMH; LS-LMH; PR-LMH.	Masonry chimneys are anchored at each floor level, at the topmost ceiling level, and at the roof. (Tier 2: Sec. 13.6.7; Commentary: Sec. A.7.9.2)			X		

Stairs

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
S-1 Stair Enclosures. HR-not required; LS-LMH; PR-LMH.	Hollow-clay tile or unreinforced masonry walls around stair enclosures are restrained out of plane and have height-to-thickness ratios not greater than the following: for Life Safety in Low or Moderate Seismicity, 15-to-1; for Life Safety in High Seismicity and for Position Retention in any seismicity, 12-to-1. (Tier 2: Sec. 13.6.2, 13.6.8; Commentary: Sec. A.7.10.1)			X		
S-2 Stair Details. HR-not required; LS-LMH; PR-LMH.	The connection between the stairs and the structure does not rely on post-installed anchors in concrete or masonry, and the stair details are capable of accommodating the drift calculated using the Quick Check procedure of Section 4.4.3.1 for moment-frame structures or 0.5 in. for all other structures without including any lateral stiffness contribution from the stairs. (Tier 2: Sec. 13.6.8; Commentary: Sec. A.7.10.2)			X		

Contents and Furnishings

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
CF-1 Industrial Storage Racks. HR-LMH; LS-MH; PR-MH.	Industrial storage racks or pallet racks more than 12 ft high meet the requirements of ANSI/RMI MH 16.1 as modified by ASCE 7, Chapter 15. (Tier 2: Sec. 13.8.1; Commentary: Sec. A.7.11.1)			X		
CF-2 Tall Narrow Contents. HR-not required; LS-H; PR-MH.	Contents more than 6 ft (1.8 m) high with a height-to-depth or height-to-width ratio greater than 3-to-1 are anchored to the structure or to each other. (Tier 2: Sec. 13.8.2; Commentary: Sec. A.7.11.2)				X	Due to time constraints and ongoing school operations in the library, tops of bookshelves could not be checked to see that their tops were restrained to the backing walls. Further investigation should be performed and restraint clips added if they bookshelves are not secured tot he backing walls.
CF-3 Fall-Prone Contents. HR-not required; LS-H; PR-H.	Equipment, stored items, or other contents weighing more than 20 lb (9.1 kg) whose center of mass is more than 4 ft (1.2 m) above the adjacent floor level are braced or otherwise restrained. (Tier 2: Sec. 13.8.2; Commentary: Sec. A.7.11.3)			X		

CF-4 Access Floors. HR-not required; LS-not required; PR-MH.	Access floors more than 9 in. (229 mm) high are braced. (Tier 2: Sec. 13.6.10; Commentary: Sec. A.7.11.4)			X		
CF-5 Equipment on Access Floors. HR-not required; LS-not required; PR-MH.	Equipment and other contents supported by access floor systems are anchored or braced to the structure independent of the access floor. (Tier 2: Sec. 13.7.7 13.6.10; Commentary: Sec. A.7.11.5)			X		
CF-6 Suspended Contents. HR-not required; LS-not required; PR-H.	Items suspended without lateral bracing are free to swing from or move with the structure from which they are suspended without damaging themselves or adjoining components. (Tier 2: Sec. 13.8.2; Commentary: Sec. A.7.11.6)			X		

Mechanical and Electrical Equipment

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
ME-1 Fall-Prone Equipment. HR-not required; LS-H; PR-H.	Equipment weighing more than 20 lb (9.1 kg) whose center of mass is more than 4 ft (1.2 m) above the adjacent floor level, and which is not in-line equipment, is braced. (Tier 2: Sec. 13.7.1 13.7.7; Commentary: Sec. A.7.12.4)			X		
ME-2 In-Line Equipment. HR-not required; LS-H; PR-H.	Equipment installed in line with a duct or piping system, with an operating weight more than 75 lb (34.0 kg), is supported and laterally braced independent of the duct or piping system. (Tier 2: Sec. 13.7.1; Commentary: Sec. A.7.12.5)				X	No existing drawings and inadequate access to verify. Further investigation should be performed.
ME-3 Tall Narrow Equipment. HR-not required; LS-H; PR-MH.	Equipment more than 6 ft (1.8 m) high with a height-to-depth or height-to-width ratio greater than 3-to-1 is anchored to the floor slab or adjacent structural walls. (Tier 2: Sec. 13.7.1 13.7.7; Commentary: Sec. A.7.12.6)			X		
ME-4 Mechanical Doors. HR-not required; LS-not required; PR-MH.	Mechanically operated doors are detailed to operate at a story drift ratio of 0.01. (Tier 2: Sec. 13.6.9; Commentary: Sec. A.7.12.7)			X		
ME-5 Suspended Equipment. HR-not required; LS-not required; PR-H.	Equipment suspended without lateral bracing is free to swing from or move with the structure from which it is suspended without damaging itself or adjoining components. (Tier 2: Sec. 13.7.1, 13.7.7; Commentary: Sec. A.7.12.8)			X		
ME-6 Vibration Isolators. HR-not required; LS-not required; PR-H.	Equipment mounted on vibration isolators is equipped with horizontal restraints or snubbers and with vertical restraints to resist overturning. (Tier 2: Sec. 13.7.1; Commentary: Sec. A.7.12.9)			X		
ME-7 Heavy Equipment. HR-not required; LS-not required; PR-H.	Floor supported or platform-supported equipment weighing more than 400 lb (181.4 kg) is anchored to the structure. (Tier 2: Sec. 13.7.1, 13.7.7; Commentary: Sec. A.7.12.10)			X		

ME-8 Electrical Equipment. HR-not required; LS-not required; PR-H.	Electrical equipment is laterally braced to the structure. (Tier 2: Sec. 13.7.7; Commentary: Sec. A.7.12.11)			X		
ME-9 Conduit Couplings. HR-not required; LS-not required; PR-H.	Conduit greater than 2.5 in. (64 mm) trade size that is attached to panels, cabinets, or other equipment and is subject to relative seismic displacement has flexible couplings or connections. (Tier 2: Sec. 13.7.8; Commentary: Sec. A.7.12.12)			X		

Piping

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
PP-1 Flexible Couplings. HR-not required; LS-not required; PR-H.	Fluid and gas piping has flexible couplings. (Tier 2: Sec. 13.7.3, 13.7.5; Commentary: Sec. A.7.13.2)			X		
PP-2 Fluid and Gas Piping. HR-not required; LS-not required; PR-H.	Fluid and gas piping is anchored and braced to the structure to limit spills or leaks. (Tier 2: Sec. 13.7.3, 13.7.5; Commentary: Sec. A.7.13.4)			X		
PP-3 C-Clamps. HR-not required; LS-not required; PR-H.	One-sided C-clamps that support piping larger than 2.5 in. (64 mm) in diameter are restrained. (Tier 2: Sec. 13.7.3, 13.7.5; Commentary: Sec. A.7.13.5)			X		
PP-4 Piping Crossing Seismic Joints. HR-not required; LS-not required; PR-H.	Piping that crosses seismic joints or isolation planes or is connected to independent structures has couplings or other details to accommodate the relative seismic displacements. (Tier 2: Sec. 13.7.3, 13.7.5; Commentary: Sec. A.7.13.6)			X		

Ducts

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
D-1 Duct Bracing. HR-not required; LS-not required; PR-H.	Rectangular ductwork larger than 6 ft2 (0.56 m2) in cross-sectional area and round ducts larger than 28 in. (711 mm) in diameter are braced. The maximum spacing of transverse bracing does not exceed 30 ft (9.2 m). The maximum spacing of longitudinal bracing does not exceed 60 ft (18.3 m). (Tier 2: Sec. 13.7.6; Commentary: Sec. A.7.14.2)			X		
D-2 Duct Support. HR-not required; LS-not required; PR-H.	Ducts are not supported by piping or electrical conduit. (Tier 2: Sec. 13.7.6; Commentary: Sec. A.7.14.3)			X		
D-3 Ducts Crossing Seismic Joints. HR-not required; LS-not required; PR-H.	Ducts that cross seismic joints or isolation planes or are connected to independent structures have couplings or other details to accommodate the relative seismic displacements. (Tier 2: Sec. 13.7.6; Commentary: Sec. A.7.14.4)			X		

Elevators

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
EL-1 Retainer Guards. HR-not required; LS-H; PR-H.	Sheaves and drums have cable retainer guards. (Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.1)			X		
EL-2 Retainer Plate. HR-not required; LS-H; PR-H.	A retainer plate is present at the top and bottom of both car and counterweight. (Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.2)			X		
EL-3 Elevator Equipment. HR-not required; LS-not required; PR-H.	Equipment, piping, and other components that are part of the elevator system are anchored. (Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.3)			X		
EL-4 Seismic Switch. HR-not required; LS-not required; PR-H.	Elevators capable of operating at speeds of 150 ft/min or faster are equipped with seismic switches that meet the requirements of ASME A17.1 or have trigger levels set to 20% of the acceleration of gravity at the base of the structure and 50% of the acceleration of gravity in other locations. (Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.4)			X		
EL-5 Shaft Walls. HR-not required; LS-not required; PR-H.	Elevator shaft walls are anchored and reinforced to prevent toppling into the shaft during strong shaking. (Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.5)			X		
EL-6 Counterweight Rails. HR-not required; LS-not required; PR-H.	All counterweight rails and divider beams are sized in accordance with ASME A17.1. (Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.6)			X		
EL-7 Brackets. HR-not required; LS-not required; PR-H.	The brackets that tie the car rails and the counterweight rail to the structure are sized in accordance with ASME A17.1. (Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.7)			X		
EL-8 Spreader Bracket. HR-not required; LS-not required; PR-H.	Spreader brackets are not used to resist seismic forces. (Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.8)			X		
EL-9 Go-Slow Elevators. HR-not required; LS-not required; PR-H.	The building has a go-slow elevator system. (Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.9)			X		

Appendix B: Concept-Level Seismic Upgrade Figures

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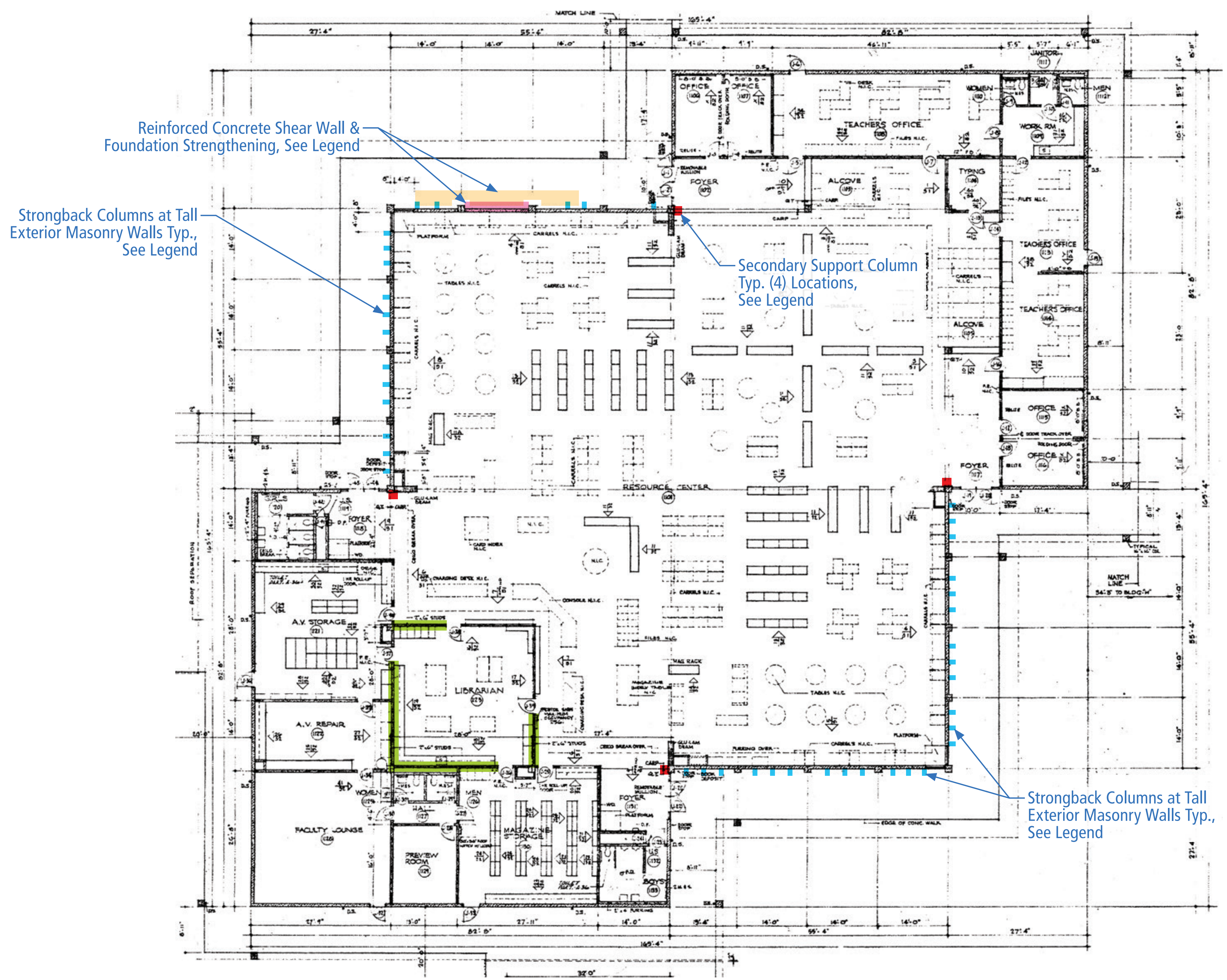

LEGEND

- 8-Inch Reinforced Shotcrete Wall, *See Detail F on Figure 3*
- Foundation Strengthening Under Shotcrete Shear Wall, *See Detail F on Figure 3*
- HSS 7x3x3/8 At 40" OC Max Strongbacks With Anchor Clips To Outside Face Of Existing CMU At 4' OC Full Height, *See Detail C on Figure 3*
- HSS 5x5x1/4 Column For Secondary Support For Existing GL Beam Above
- Sheathe & Nail Existing Stud Wall As Shear Wall With 1/2" Plywood, Blocking Between Studs, & Holdowns At Each End

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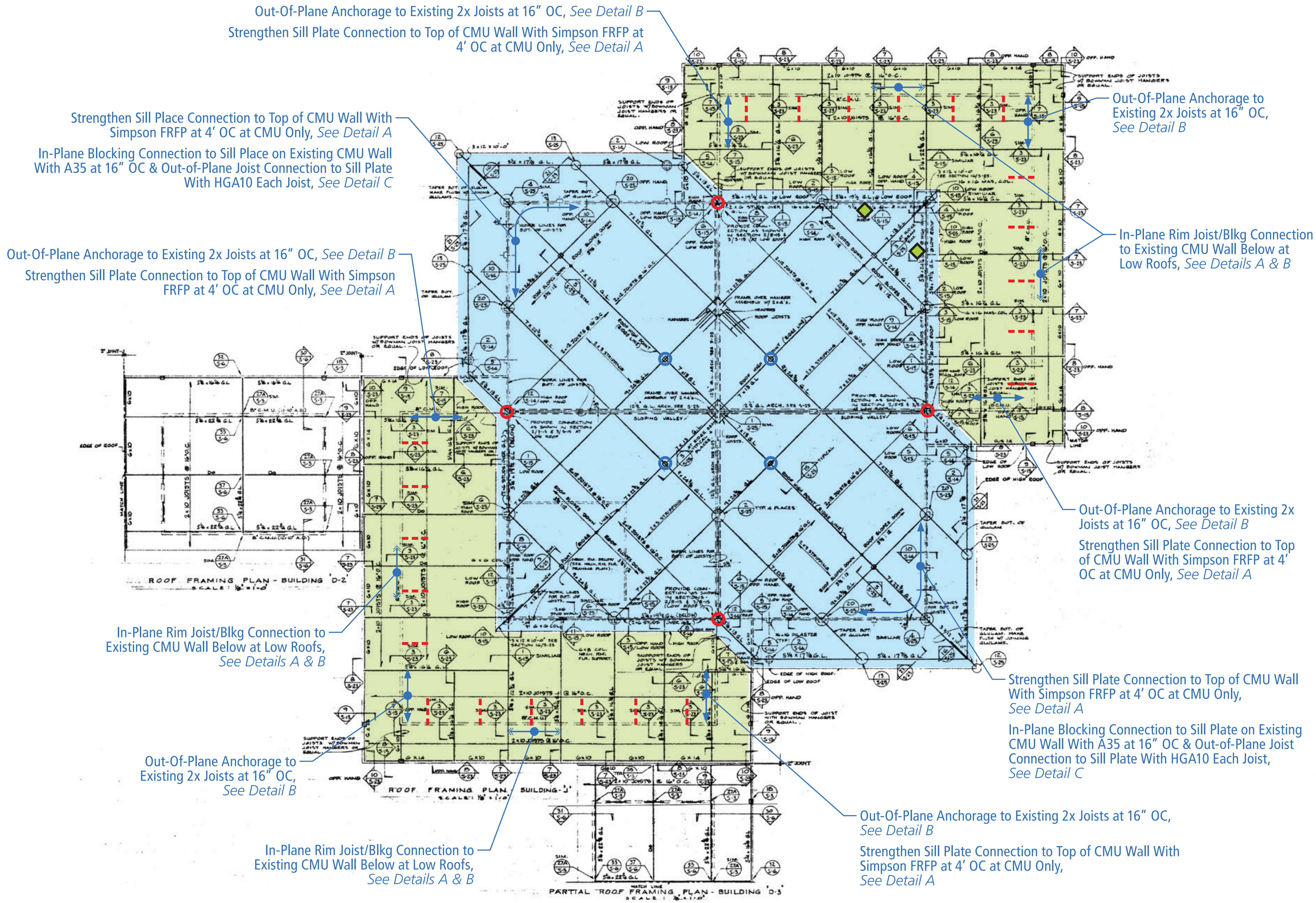
Marysville-Pilchuck High School – Library (Building J)

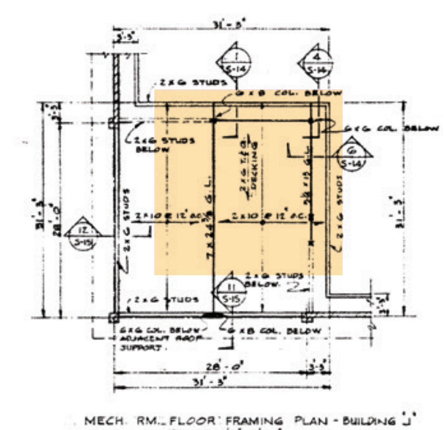
Washington State School Seismic Safety Assessments Project – Marysville School District 25 – June 2021

Figure 1 – Floor Plan



LEGEND

- Out-Of-Plane Wall Anchorage, Blocking, & Strapping Between Existing GL Girders, *See Detail A on Figure 3*
- Laminate Clerestory Glazing On Inside Face With Security Window Film
- Existing Low GL Strut To Existing CMU Shear Wall Connection, Typ.
- Existing GL Beam To Existing GL Beam Interconnection, Typ., *See Detail E on Figure 3*
- Remove & Replace Roof, Remove & Replace Existing Ceiling To Add Blocking At Existing Unframed Plywood Panel Edges From Underneath, Nail All Plywood Panel Edges With 10D At 4" OC
  H1 Clip Connections At Alternate Joists Throughout For Connection of Girders To Diaphragm, *See Detail D on Figure 3*
- Remove & Replace Roof, Remove & Replace Existing Ceiling To Add Blocking At Existing Unframed Plywood Panel Edges From Underneath. Nail All Plywood Panel Edges With 10D @ 4" OC
  H1 Clip Connections At Alternate Joists Throughout For Connection of Girders To Diaphragm, *See Detail D on Figure 3*
- Sheathe Underside Of Mezzanine Floor Framing With 1/2" Plywood & Nail At All Panel Edges, Attach To Added Shear Walls Below



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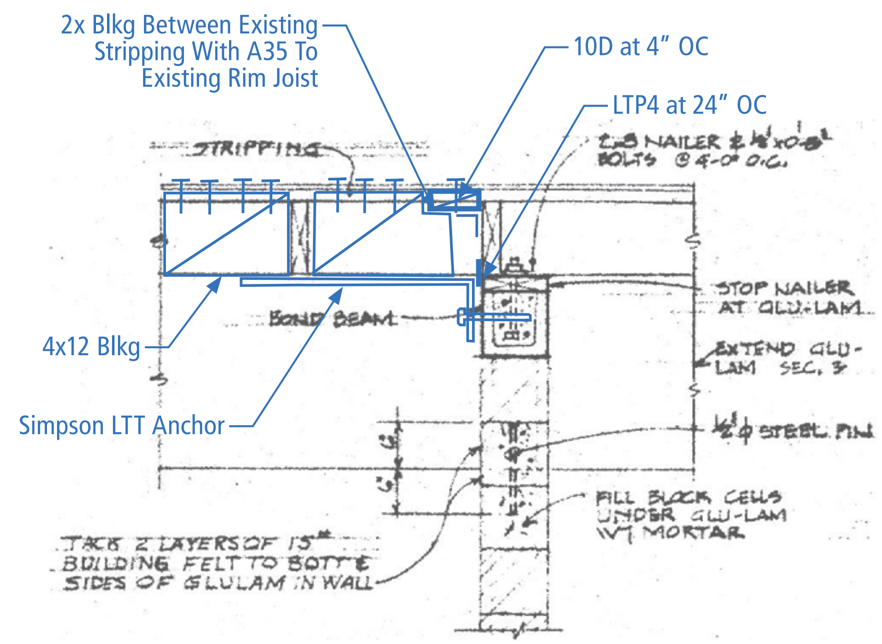
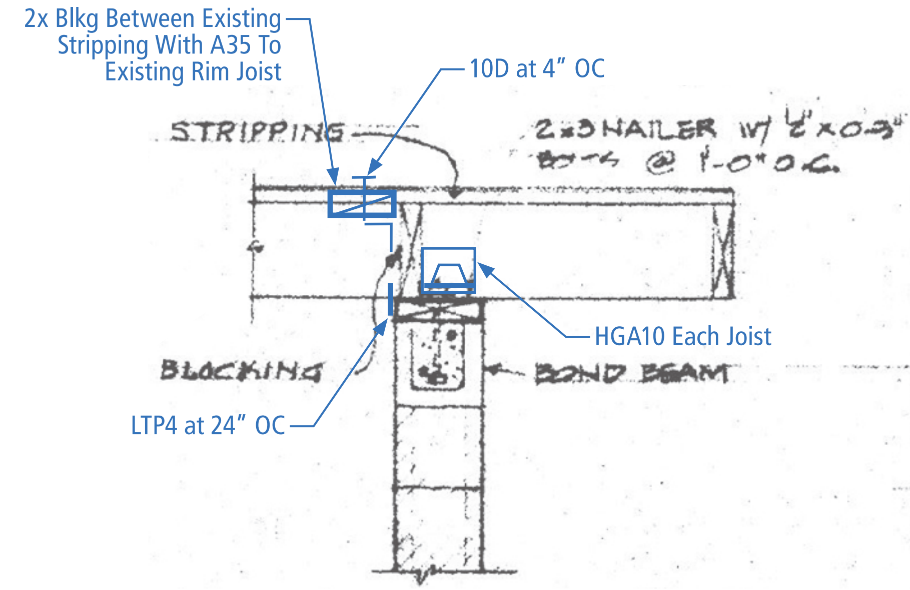
Marysville-Pilchuck High School – Library (Building J)

Washington State School Seismic Safety Assessments Project – Marysville School District 25 – June 2021

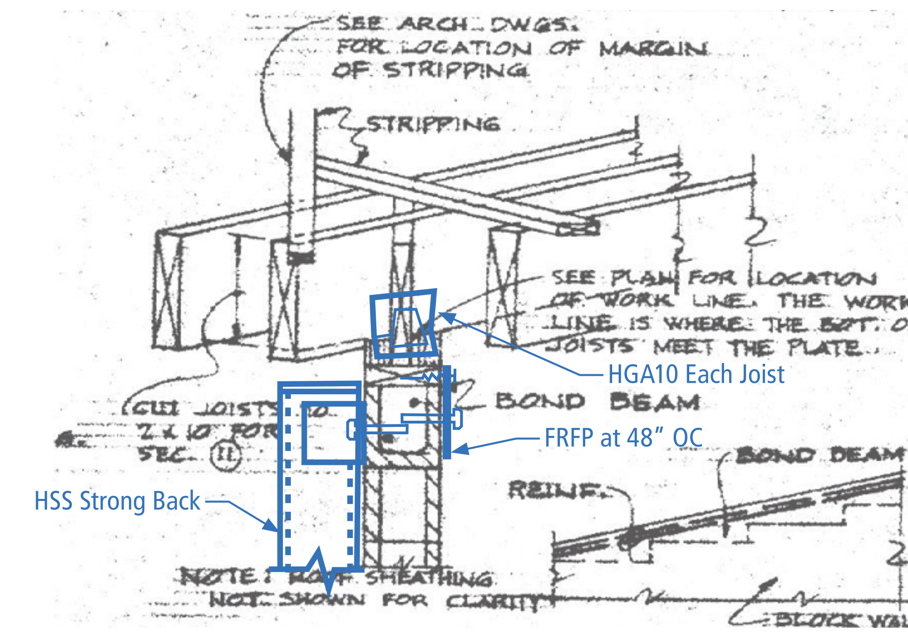
Figure 2 – Roof Plan



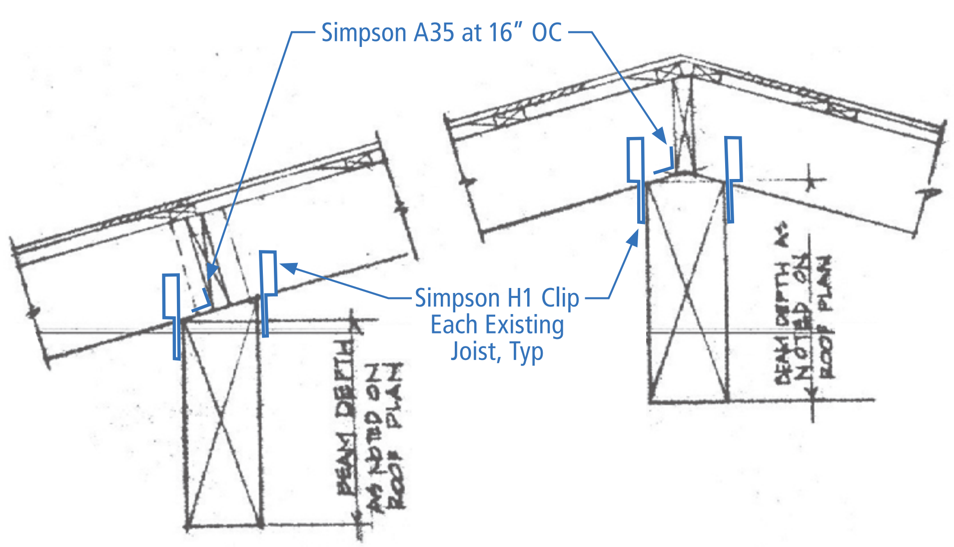
Ⓐ LOW ROOF FRAMING CONNECTIONS



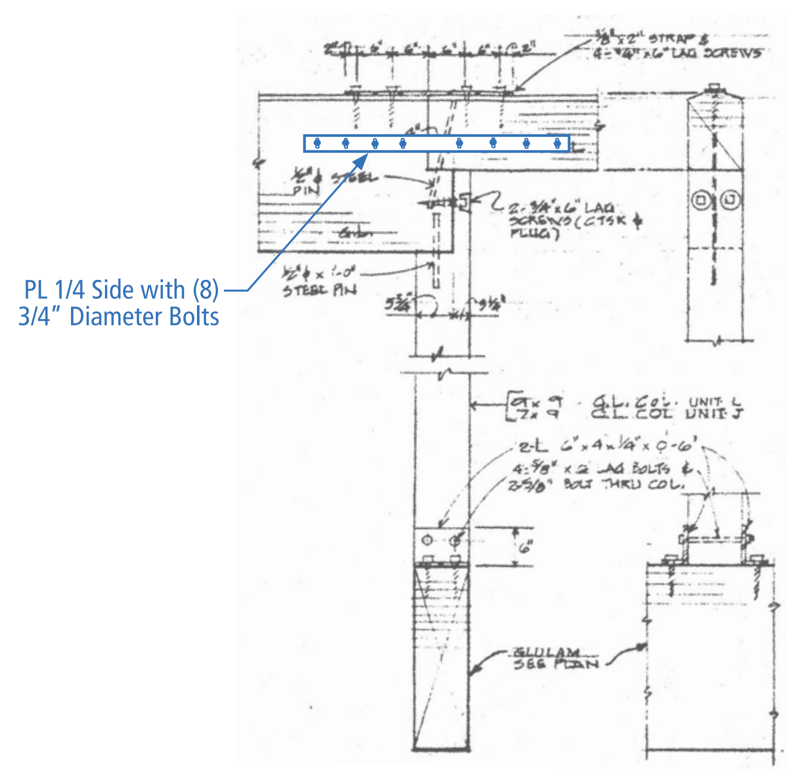
Ⓑ LOW ROOF FRAMING CONNECTIONS



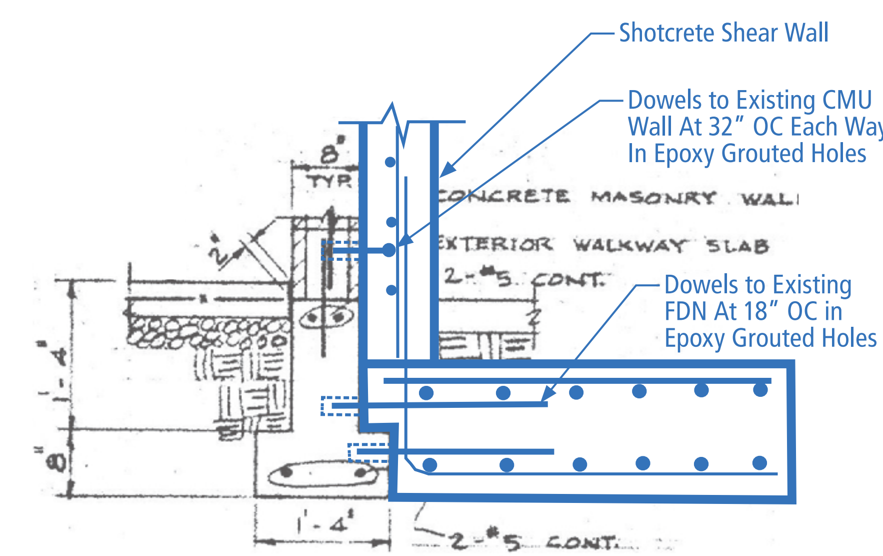
Ⓒ HIGH ROOF FRAMING CONNECTIONS



Ⓓ HIGH ROOF FRAMING CONNECTIONS



Ⓔ GIRDER-TO-GIRDER CONNECTIONS



Ⓕ SHOTCRETE SHEAR WALL & FDN

Figure 3 – Conceptual Upgrade Details

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Appendix C: Opinion of Probable Construction Costs

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PRODIMS PROJECT MANAGEMENT SERVICES

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tel: (425) 828-0500
fax: (425) 828-0700
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Name:	**Wa State School Seismic Safety Assessment Phase 2**
Second Name:	**Marysville-Pilchuck High School Library Building (Building J)**
Location:	**Mount Vernon, WA**
Design Phase:	**ROM Cost Estimates**
Date of Estimate:	**January 6, 2021**
Date of Revision:	**April 12, 2021**
Month of Cost Basis:	**1Q, 2021**

Marysville-Pilchuck High School Library Building (Building J)

Master Estimate Summary

Project Name	Construction Cost Type	Estimated Construction Cost
Marysville-Pilchuck High School Library Buil	Structural Costs	$1,768,538
Marysville-Pilchuck High School Library Buil	Non-Structural Costs	$540,547
TOTAL ESTIMATED CONSTRUCTION COST →		**$2,309,085**

Soft Costs	Soft Costs % Construction Cost	Estimated Soft Costs
Project Soft Cost Allowance	40.0%	**$923,634**
		Sum of the Above
TOTAL ESTIMATED PROJECT COST →		**$3,232,719**

Estimate Assumptions:

The ROM Construction Cost estimates are based on the Concept Design Report for the Project.
Construction Escalation is not included. Costs are current as of the month of Cost Basis noted above right.

Estimate Qualifications:

The ROM estimates are not be relied on solely for proforma development and financial decisions.
Further design work is required to determine construction budgets.
All Buildings Estimated to the 5' foot line for Utilities, All Sitework is estimated to go with any combination of the buildings and alternatives.
The ROM estimates do not include any Hazardous Material Abatement/Disposal.
For Construction Cost Markups they are additive, not cumulative. Percentages are added to the previous subtotal rather than the direct cost subtotal.
Owner Soft Costs Allowance are: A/E design fees, QA/QC, Project Administration, Owners Project Contingency, Average Washington State Sale Tax and
Estimated labor is based on an 8 hour per day shift 5 days a week. Accelerated schedule work of overtime has not been included.
Estimated labor is based on working on unoccupied facility without phased construction.
Estimate is based on a competitive public bid with at least 3 bona fide submitted and unrescinded general contractor bids.
Estimate is based on a competitive public bid with a minimum 6 week bidding schedule and no significant addendums within 2 weeks of bid opening.
State of Washington General Contractor/ Construction Manager (GC/CM) contracts typically raises construction costs. It is Not Included in this estimate.
Estimated construction cost is for the entire project. This estimate is not intended to be used for other projects.
Please consult the cost estimator for any modifications to this estimate. Unilaterally adding and deleting markups, scope of work, schedule, specifications, plans and bid forms could incorrectly restate the project construction cost.
Construction reserve contingency for change orders is not included in the estimate.
Sole source supply of materials and/ or installers typically results in a 40% to 100% premium on costs over open specifications.

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Structural Costs

Name:	Wa State School Seismic Safety Assessment Phase 2	Areas	sqft
Second Name:	Marysville-Pilchuck High School Library Building (Building J)	Building Area	20,000
Location:	Mount Vernon, WA		
Design Phase:	ROM Cost Estimates		
Date of Estimate:	January 6, 2021		
Date of Revision:	April 12, 2021		
Month of Cost Basis:	1Q, 2021	Total Areas	20,000

Marysville-Pilchuck High School Library Building (Building J)

Construction Cost Estimate

Subtotal Direct Cost From the Estimate Detail Below $ 1,201,521

	Percentage of Previous Subtotal	Amount	Running Subtotal
Scope Contingency	10.0%	$ 120,152	$ 1,321,673
General Conditions	10.0%	$ 120,152	$ 1,441,825
Home Office Overhead	5.0%	$ 60,076	$ 1,501,901
Profit	6.0%	$ 72,091	$ 1,573,993
Escalation Included to 4Q, 2022	12.4%	$ 194,545	$ 1,768,538
Washington State Sales Tax - Included in Soft Costs			
Total Markups Applied to the Direct Cost	47.19%		
Markups are multiplied on each subtotal- They are not multiplied from the direct cost			

		$/sqft
TOTAL ESTIMATED CONSTRUCTION COST--	**$ 1,768,538**	**$ 88.43**
-20% TOTAL ESTIMATED CONSTRUCTION COST VARIANCE --	**$ 1,414,830**	**$ 70.74**
+50% TOTAL ESTIMATED CONSTRUCTION COST VARIANCE --	**$ 2,652,807**	**$ 132.64**

Please see the Master Summary for Assumptions and Qualifications for ROM Cost Estimates

Direct Cost of Construction

WBS	Description	Quantity	U of M	Labor	Labor Total	Material	Material Total	Equipment	Equipment Total	Total $/U of M	Direct Cost
1 - Seismic Retrofit											
Foundations											
	Spread Footings System- Excavation, Backfill, Formwork, Concrete, Reinforcing and Detailing. Remove and Restore Hardscape Surface. Detail F.	8.0	cuyd	$ 716.25	$ 5,749.90	$ 238.75	$ 1,916.63	$ 57.30	$ 459.99	$ 1,012.30	$ 8,126.52
Superstructure											
Upper Floor Systems											
	Shotcrete 8" Thick Shear Wall with #6 at 12" oc. at the Northeast Exterior Wall of the Library	23.6	cuyd	$ 374.00	$ 8,835.27	$ 176.00	$ 4,157.77	$ 33.00	$ 779.58	$ 583.00	$ 13,772.62
Roof Systems											
	Install Tube Steel Columns HSS 5x5x1/4 for Secondary GLB Beam Support - Restore GWB Wall and Wrap with GWB/Metal Stud Finish	0.76	ton	$ 3,510.00	$ 2,653.59	$ 2,990.00	$ 2,260.46	$ 390.00	$ 294.84	$ 6,890.00	$ 5,208.90
	Install Tube Steel Columns HSS 7x3x3/8 for Strongback Support Fasten to CMU Wall.	15.13	ton	$ 4,212.00	$ 63,741.48	$ 3,588.00	$ 54,298.30	$ 468.00	$ 7,082.39	$ 8,268.00	$ 125,122.17
	Add 1/2" Plywood Sheathing with Panel Edge Blocking at Existing Wood Stud Wall	600	sqft	$ 1.37	$ 823.50	$ 0.88	$ 526.50	$ 0.14	$ 81.00	$ 2.39	$ 1,431.00
	ADD BLOCKING AT (E) UNFRAMED PLYWOOD PANEL EDGES FROM UNDERNEATH. NAIL ALL PLYWOOD PANEL EDGES W/ 10d @ 4" OC.	28,000	sqft	$ 1.22	$ 34,020.00	$ 1.04	$ 28,980.00	$ 0.14	$ 3,780.00	$ 2.39	$ 66,780.00
	Add SIMPSON LTT ANCHOR nailed to Blocking and Install Anchor Bolt in CMU Bond Beam, 6' of 16 GA STRAPPING, 4x12 BLOCKING BTWN JOISTS FOR 6 feet for OUT-OF-PLANE WALL ANCHORAGE, SEE DETAIL A	22	loc	$ 240.84	$ 5,298.48	$ 205.16	$ 4,513.52	$ 26.76	$ 588.72	$ 472.76	$ 10,400.72
	At 16" o.c. Add HGA 10 Clip at Each Joist for OUT-OF-PLANE ANCHORAGE, SEE DETAIL B	105	each	$ 25.60	$ 2,688.00	$ 14.40	$ 1,512.00	$ 2.40	$ 252.00	$ 42.40	$ 4,452.00
	Add 2x BLOCKING BTWN JOISTS with A35 Clips and LTP4 Clips at 24" o.c. for IN-PLANE ANCHORAGE, SEE DETAILS A+B	440	lnft	$ 31.21	$ 13,730.20	$ 8.30	$ 3,649.80	$ 2.37	$ 1,042.80	$ 41.87	$ 18,422.80

WBS	Description	Quantity	U of M	Labor	Labor Total	Material	Material Total	Equipment	Equipment Total	Total $/U of M	Direct Cost
	IN-PLANE BLOCKING CONNECTION TO SILL PLATE ON (E)CMU WALL W/ A35 @ 16" OC, AND OUT-OF-PLANE JOIST CONNECTION TO SILL PLATE W/ HGA10 EACH JOIST, SEE DETAIL C	440	lnft	$ 20.70	$ 9,108.00	$ 9.30	$ 4,092.00	$ 1.80	$ 792.00	$ 31.80	$ 13,992.00
	LAMINATE CLERESTORY GLAZING ON INSIDE FACE WITH SECURITY WINDOW FILM	400	sqft	$ 8.80	$ 3,520.00	$ 7.20	$ 2,880.00	$ 0.96	$ 384.00	$ 16.96	$ 6,784.00
	Connect LOW GLB STRUT TO Existing CMU SHEAR WALL	4	each	$ 248.00	$ 992.00	$ 152.00	$ 608.00	$ 24.00	$ 96.00	$ 424.00	$ 1,696.00
	Connect GLB BEAM TO GLB Beam, SEE DETAIL E - 1/4" Plate with 8 each 3/4" Dia Bolts	6	each	$ 364.00	$ 2,184.00	$ 196.00	$ 1,176.00	$ 33.60	$ 201.60	$ 593.60	$ 3,561.60
	New H1 CLIP CONNECTIONS AT ALTERNATE JOISTS THROUGHOUT FOR CONNECTION OF JOISTS TO BEAMS, SEE DETAIL D - Approx. 8 Clips per 100 sqft	22,000	sqft	$ 0.78	$ 17,160.00	$ 0.42	$ 9,240.00	$ 0.07	$ 1,584.00	$ 1.27	$ 27,984.00
	SILL PLATE CONNECTION, FRFP @ 48" o.c., SEE DETAIL C	79	each	$ 75.90	$ 5,996.10	$ 34.10	$ 2,693.90	$ 6.60	$ 521.40	$ 116.60	$ 9,211.40
	Add 1/2" Plywood Sheathing with Panel Edge Blocking at Existing Wood Joist Flooring	900	sqft	$ 1.27	$ 1,140.75	$ 0.68	$ 614.25	$ 0.12	$ 105.30	$ 2.07	$ 1,860.30
Exterior Closure											
	Exterior Wall System										
	New Metal Siding with Metal Stud Backup Finish System at New Shotcrete Wall	952	sqft	$ 14.88	$ 14,165.76	$ 9.12	$ 8,682.24	$ 1.44	$ 1,370.88	$ 25.44	$ 24,218.88
	New Metal Siding with Metal Stud Backup Wrap Finish System at New Strongbacks	41	each	$ 354.64	$ 14,540.24	$ 217.36	$ 8,911.76	$ 34.32	$ 1,407.12	$ 606.32	$ 24,859.12
Roofing System											
	Remove Roofing System - Inclusind Extra 2 x3 stripping and 5/8" Plywood	28,000	sqft	$ 1.91	$ 53,550.00	$ 2.34	$ 65,450.00	$ 0.26	$ 7,140.00	$ 4.51	$ 126,140.00
	New Membrane Roofing System with R-38 Rigid Insulation, Flashing and Trim and Downspout Roof Drainage System	28,000	sqft	$ 8.78	$ 245,700.00	$ 10.73	$ 300,300.00	$ 1.17	$ 32,760.00	$ 20.67	$ 578,760.00
Interior Wall/Door/Casework/Specialties Systems											
	Remove and Reinstall Casework at Wall Plywood Sheathing Installation Near Mech Mezzanine	1	set	$ 3,025.00	$ 3,025.00	$ 2,475.00	$ 2,475.00	$ 330.00	$ 330.00	$ 5,830.00	$ 5,830.00
	Remove and Reinstall New Ceiling Systems at Mezzanine Plywood Sheathing Installation	900	sqft	$ 3.30	$ 2,970.00	$ 2.70	$ 2,430.00	$ 0.36	$ 324.00	$ 6.36	$ 5,724.00
	Remove and Reinstall GWB/Base Finish Systems at Wood Sheathing Installation	600	sqft	$ 3.01	$ 1,804.20	$ 1.84	$ 1,105.80	$ 0.29	$ 174.60	$ 5.14	$ 3,084.60

WBS	Description	Quantity	U of M	Labor	Labor Total	Material	Material Total	Equipment	Equipment Total	Total $/U of M	Direct Cost
	Remove and Reinstall New ACT Ceiling Systems at Low Roof Seismic Components Installation	7,800	sqft	$ 3.30	$ 25,740.00	$ 2.70	$ 21,060.00	$ 0.36	$ 2,808.00	$ 6.36	$ 49,608.00
	Remove and Reinstall New 5/8" GWB and 5/8" Textured Plywood Ceiling Systems at High Roof Seismic Components Installation	7,800	sqft	$ 4.60	$ 35,895.60	$ 3.20	$ 24,944.40	$ 0.47	$ 3,650.40	$ 8.27	$ 64,490.40
Subtotal of the Direct Cost of Construction				**Marysville-Pilchuck High School Library Building (Building J)**							**$ 1,201,521**

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Non-Structural Costs

Name:	Wa State School Seismic Safety Assessment Phase 2	Areas	sqft
Second Name:	Marysville-Pilchuck High School Library Building (Building J)	Building Area	20,000
Location:	Mount Vernon, WA		
Design Phase:	ROM Cost Estimates		
Date of Estimate:	January 6, 2021		
Date of Revision:	April 12, 2021		
Month of Cost Basis:	1Q, 2021	Total Areas	20,000

Marysville-Pilchuck High School Library Building (Building J)

Construction Cost Estimate

Subtotal Direct Cost From the Estimate Detail Below $ 367,240

	Percentage of Previous Subtotal	Amount	Running Subtotal
Scope Contingency	10.0%	$ 36,724	$ 403,964
General Conditions	10.0%	$ 36,724	$ 440,688
Home Office Overhead	5.0%	$ 18,362	$ 459,050
Profit	6.0%	$ 22,034	$ 481,085
Escalation Included to 4Q, 2022	12.4%	$ 59,462	$ 540,547
Washington State Sales Tax - Included in Soft Costs			
Total Markups Applied to the Direct Cost	47.19%		
Markups are multiplied on each subtotal- They are not multiplied from the direct cost			

		$/sqft
TOTAL ESTIMATED CONSTRUCTION COST--→	**$ 540,547**	**$ 27.03**
-20% TOTAL ESTIMATED CONSTRUCTION COST VARIANCE --→	**$ 432,438**	**$ 21.62**
+50% TOTAL ESTIMATED CONSTRUCTION COST VARIANCE --→	**$ 810,820**	**$ 40.54**

Please see the Master Summary for Assumptions and Qualifications for ROM Cost Estimates

Direct Cost of Construction

WBS	Description	Quantity	U of M	Labor	Labor Total	Material	Material Total	Equipment	Equipment Total	Total $/U of M	Direct Cost
	2- Non- Structural Demo/Restoration*										
	Exteriors, Interiors and M/E/P/FP systems										
	Exterior Wall Systems										
	LAMINATE CLERESTORY GLAZING ON INSIDE FACE WITH SECURITY WINDOW FILM	400	sqft	$ 8.80	$ 3,520.00	$ 7.20	$ 2,880.00	$ 0.96	$ 384.00	$ 16.96	$ 6,784.00
	M/E/P/FP Systems										
	Mechanical/Electrical/Fire Protection Systems *	20,000	sqft	$ 9.35	$ 187,029.22	$ 7.65	$ 153,023.90	$ 1.02	$ 20,403.19	$ 18.02	$ 360,456.31

*Allows 30 percent of existing nonstructural systems M/E/P/FP require upgrades/replacement.

Subtotal of the Direct Cost of Construction	**Marysville-Pilchuck High School Library Building (Building J)**	**$ 367,240**

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Appendix D: Earthquake Performance Assessment Tool (EPAT) Worksheet

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Washington Schools Earthquake Performance Assessment Tool (EPAT)
RESULTS SUMMARY

District Name	Marysville	**Existing Building Life Safety Risk & Priority for Retrofit or Replacement**
School Name	Marysville Pilchuck High School	
Building Name	Library - Bldg J	Very High

Building Data

HAZUS Building Type	RM1	Reinforced Masonry Bearing Walls w/ Wood or Metal Diaphragms
Year Built	1970	These parameters determine the capacity of the existing building to withstand earthquake forces.
Building Design Code	<1973 UBC	
Existing Building Code Level	Pre	
Geographic Area	Puget Sound	
Severe Vertical Irregularity	No	Buildings with irregularities have greater earthquake damage than otherwise similar buildings that are regular.
Moderate Vertical Irregularity	Yes	
Plan Irregularity	Yes	

Seismic Data

Earthquake Ground Shaking Hazard Level	High	Frequency and severity of earthquakes at this site
Percentile S_s Among WA K-12 Campuses	40%	Earthquake ground shaking hazard is higher than 40% of WA campuses.
Site Class (Soil or Rock Type)	D	Stiff Soil
Liquefaction Potential	Low to Moderate	Liquefaction increases the risk of major damage to a building
Combined Earthquake Hazard Level	High	Earthquake ground shaking and liquefaction potential

Severe Earthquake Event (Design Basis Earthquake Ground Motion)[1]

Building State	**Building Damage Estimate**[2]	**Probability Building is not Repairable**[3]	**Life Safety**[4] **Risk Level**	**Most Likely Post-Earthquake Tagging**[5]
Existing Building	77%	77%	Very High	Red
Life Safety Retrofit Building	14%	7.1%	Very Low	Green/Yellow
Current Code Building	11%	4.5%	Very Low	Green

1. 2/3rds of the 2% in 50 year ground motion
2. Percentage of building replacement value.
3. Probability building is in the Extensive or Complete damage states. For existing buildings, the probability that the building is not economically repairable may be higher: some buildings in the Moderate Damage state are also likely to be demolished.
4. Based on probability of Complete Damage State.
5. Most likely post-earthquake damage state per ATC-20.

Source for the Data Entered into the Tool

Building Evaluated By:	Brian Matsumoto, Drew Nielson & Suzie Bauer
Person(s) Who Entered Data in EPAT:	Rami Sabra, Reid Middleton
User Overrides of Default Parameters:	Building Design Code Year, Site Class, Liquefaction

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Appendix E: Marysville-Pilchuck High School Main Building Existing Drawings

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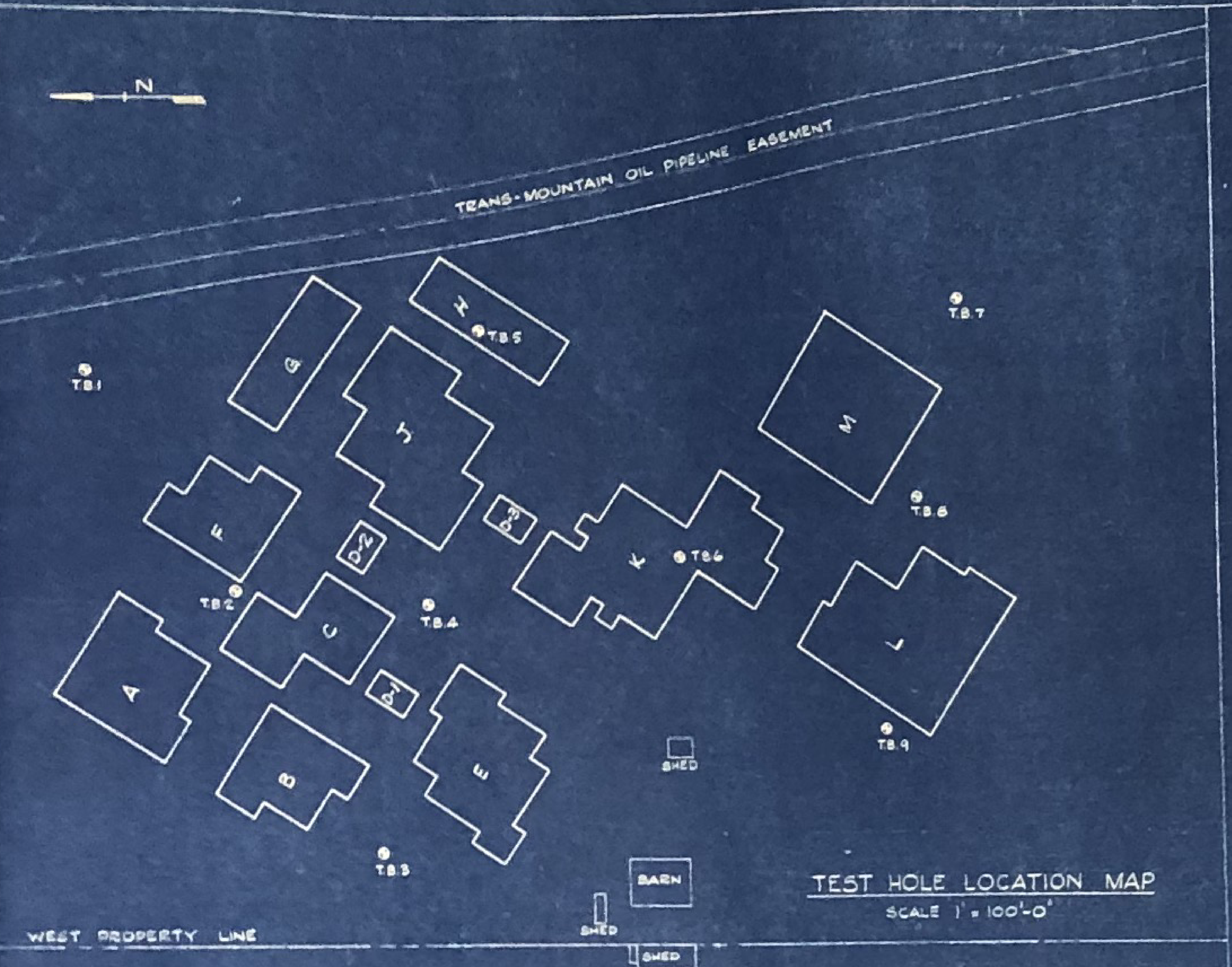
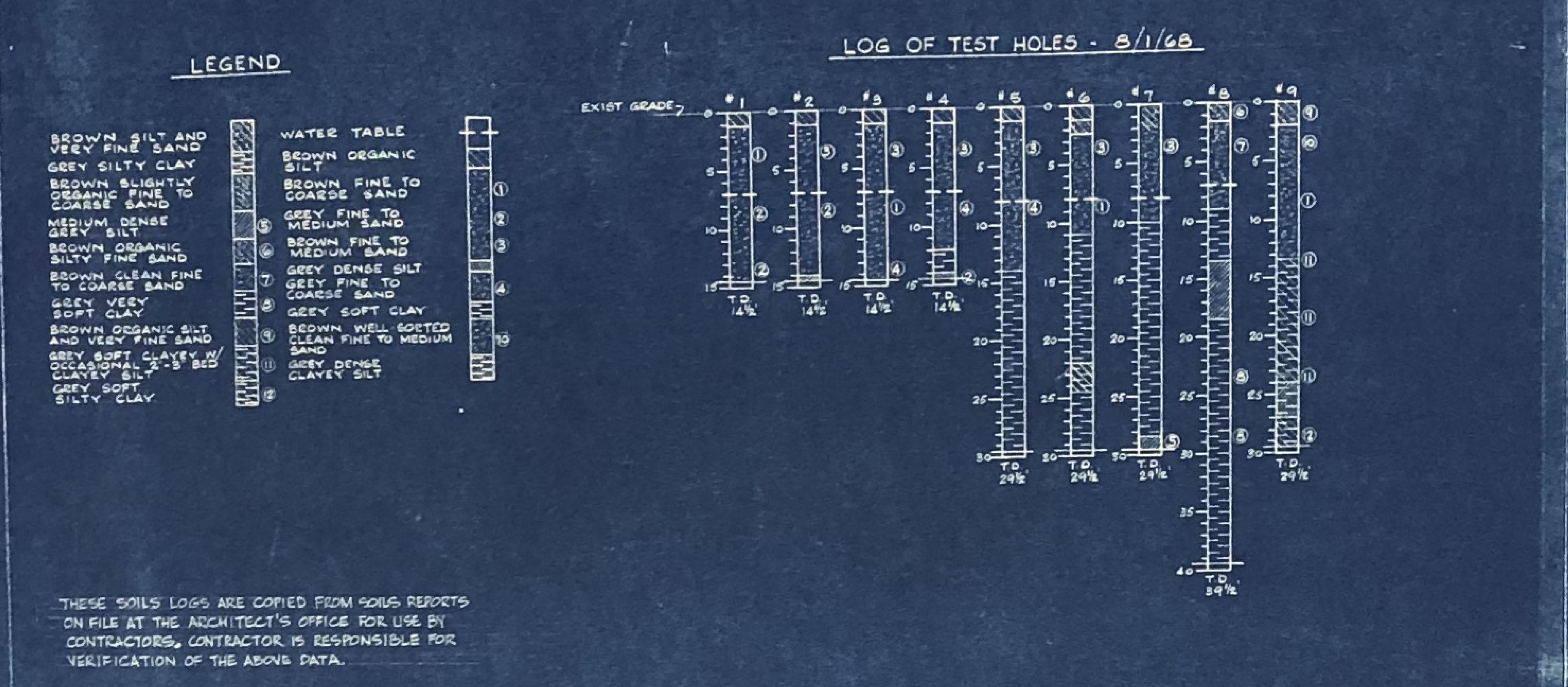
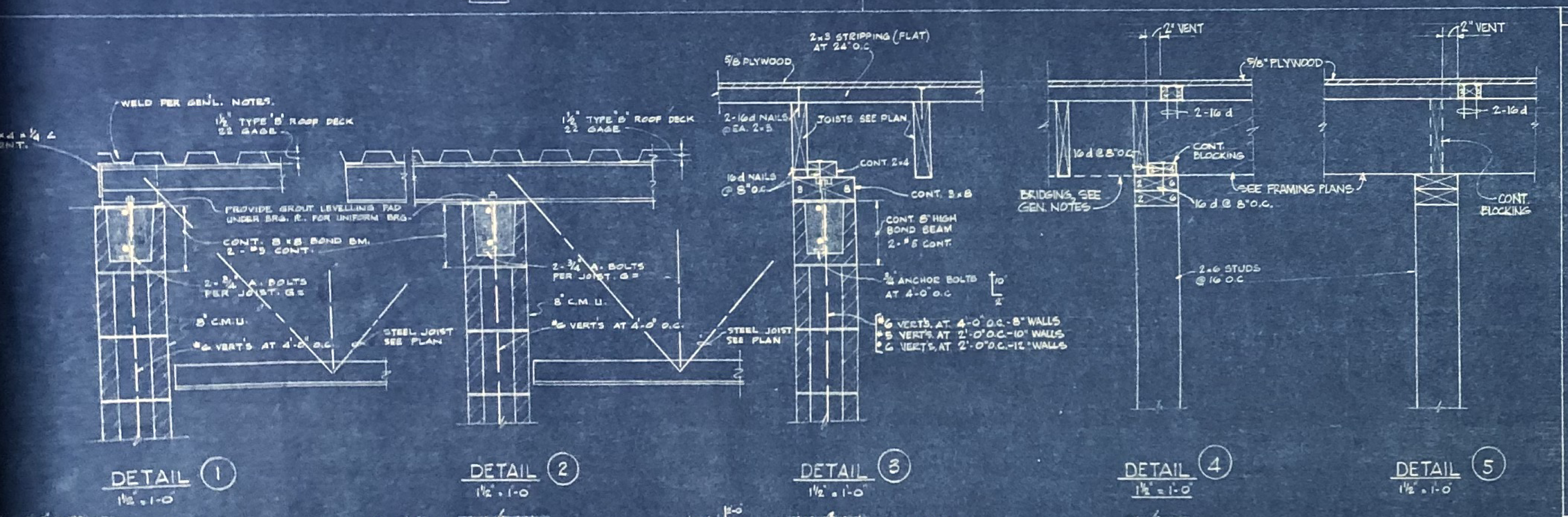
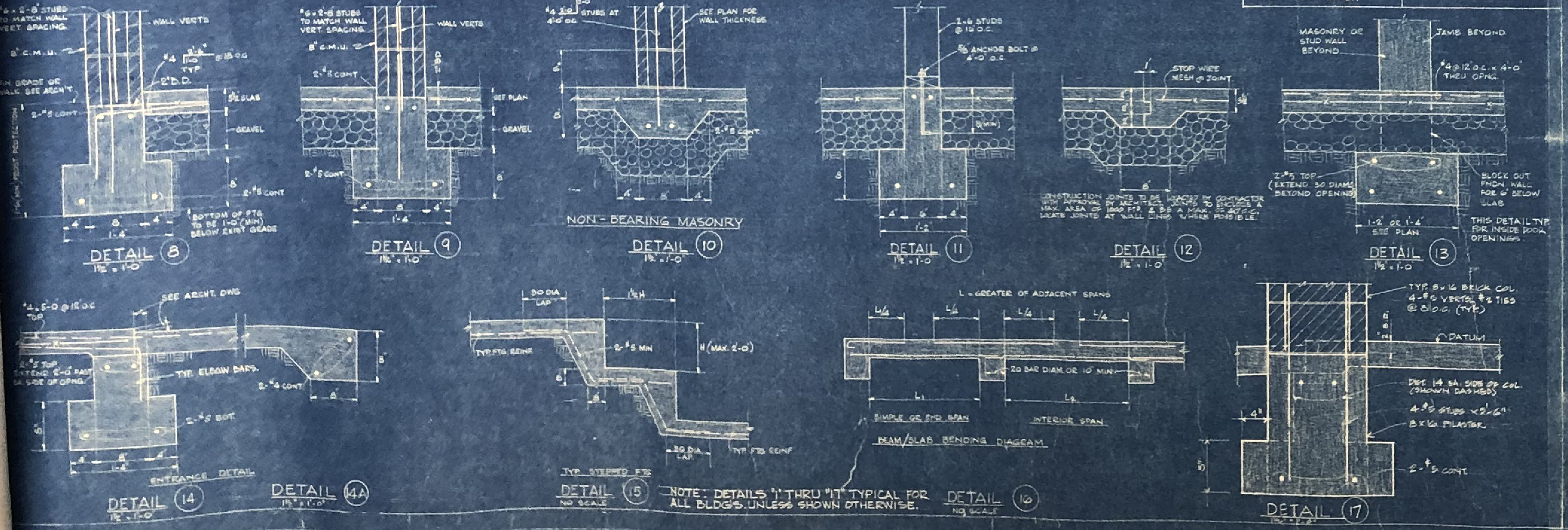






LIST OF ABBREVIATIONS

A.D.	ABOVE DATUM	OPNG.	OPENING
&	AND	O.S.	OUT SIDE
L	ANGLE		
@	AT	PNL.	PANEL
		PL	PLATE
BM.	BEAM	PT.	POINT
B.D.	BELOW DATUM	P.S.F.	POUNDS PER SQ. FT.
BOS.	BOSOM		
BOT.	BOTTOM		
BLDG.	BUILDING	REINF.	REINFORCEMENT
		REQ'D.	REQUIRED
℄	CENTER LINE	Φ	ROUND
C	CHANNEL		
CLR.	CLEAR	SECT.	SECTION
COL.	COLUMN	SHT.	SHEET
CONC.	CONCRETE	SIM.	SIMILIAR
CMU.	CONCRETE MASONRY UNIT	SP.	SPACE
		SPECS.	SPECIFICATIONS
CONN.	CONNECTION	SQ., □	SQUARE
CONST.	CONSTRUCTION	STIFF.	STIFFENER
CONT.	CONTINUOUS	STL.	STEEL
DET.	DETAIL	TEMP.	TEMPERATURE
		THD.	THREAD
EA.	EACH	TYP.	TYPICAL
E.E.	EACH END		
E.S.	EACH SIDE	VERT.	VERTICAL
ELEV. EL.	ELEVATION		
EQ.	EQUAL	W/	WITH
E.W.	EACH WAY	W/O	WITHOUT
		WF	WIDE FLANGE
FIN.	FINISH		
FLR.	FLOOR		
G.	GAGE		
GEN.	GENERAL		
HORIZ.	HORIZONTAL		
I.S.	INSIDE		
N.T.S.	NOT TO SCALE		
NO.	NUMBER		
O.C.	ON CENTER		



GENERAL STRUCTURAL NOTES (SEE SHEET S-2 FOR ADDITIONAL NOTES)

THE FOLLOWING NOTES APPLY EXCEPT WHERE SHOWN OTHERWISE

CODE: UNIFORM BUILDING CODE, 1967

LIVE LOADS

CLASSROOMS	40 PSF	ROOF LIVE LOAD	25 PSF
AUDITORIUM, BALCONY	100 PSF	EARTHQUAKE	ZONE III
CORRIDORS, STAIRS	100 PSF	RESTROOMS, OFFICES	50 PSF
MECHANICAL ROOMS	100 PSF	LIBRARY READING ROOM	60 PSF
STORAGE	125 PSF	LIBRARY STACKS	125 PSF
WIND	20 PSF		

FOUNDATIONS

MAXIMUM SOIL PRESSURE 3000 PSF EXCEPT BLDG. "L" (POOL) 1500 PSF AT ELEVATION 70'
EXTERIOR FOOTINGS AND EXTERIOR SPANDREL BEAMS 1'-6" MINIMUM BELOW FINISH GRADE. ALL FOOTINGS TO BEAR ON FIRM UNDISTURBED EARTH, 1'-0" MINIMUM BELOW EXISTING GRADE.
BACKFILL TO BE THOROUGHLY COMPACTED PER SPECIFICATIONS (TO 95% DENSITY).
PROVIDE 2 - #5 CONTINUOUS MINIMUM BOTTOM OF ALL WALLS AND FOOTINGS.

CONCRETE

CLASS AND USE	f'c	SLUMP	SACKS/C.Y.	ADMIXTURE
A - FOOTINGS AND FOUNDATIONS	2500	4 - 5	5½	NONE
B - SLABS ON GRADE	2500	3 - 4	5½	PLASTIMENT, POZOLITH OR EQUAL
C - STRUCTURAL CONCRETE ABOVE GROUND FLOOR	3000	3 - 4	6	PLASTIMENT, POZOLITH OR EQUAL
D - SIDEWALK SLABS, EXTERIOR STAIRS	2500	3 - 4	5½	3% TO 6% AIR ENTRAINMENT.
E - SETTING BEARING PLATES & PANELS	2500	DRY PACK	—	NON SHRINK

REINFORCING STEEL

REINFORCING STEEL DEFORMED, INTERMEDIATE GRADE fy = 40,000 PSI. A.S.T.M. A-15, EXCEPT COLUMNS. COLUMN VERTICALS TO BE A.S.T.M. A-432. fy = 60,000 PSI.
REINFORCING STEEL DETAILS SHALL BE PREPARED BY AN EXPERIENCED PROFESSIONAL DETAILER APPROVED BY THE ARCHITECT AND CONFORM TO STANDARD PRACTICE OUTLINED IN A.C.I. REPORT 315-57.

CONCRETE COVER OF REINFORCING:
3" CONCRETE POURED AGAINST EARTH
2" FORMED CONCRETE WITH EARTH BACKFILL
1½" BEAMS AND COLUMNS (STIRRUPS, TIES) WALLS EXPOSED TO WEATHER, SLABS ON MOISTURE BARRIER.
1" WALLS, INSIDE FACE; 3/4" JOISTS AND FORMED SLABS.

LAP COLUMN VERTICALS, CLASS "A" CONCRETE 32 DIAMETERS. LAP ALL OTHER REINFORCING 24 DIAMETERS.
SPLICES AT TENSION REGIONS SHALL NOT BE PERMITTED.

WALLS

REINFORCE AS FOLLOWS:

THICKNESS	HORIZONTAL	VERTICAL
6" WALL & UNDER	#5 AT 18" O.C.	#5 AT 18" MIN.
8" WALL	#5 AT 12" O.C.	#5 AT 18"
10" WALL	#4 AT 12" E.F.	#4 AT 18" E.F.
12" WALL	#5 AT 18" E.F.	#5 AT 18" E.F.
ALL OTHER WALLS	0.3 OF 1%	0.2 OF 1%

AT OPENINGS PROVIDE 2 - #5 EXTRA BARS AT TOP, BOTTOM AND EACH SIDE EXTENDING 30 DIAMETERS BEYOND CORNERS AND 2 - #5 x 4'-0" DIAGONALS AT EACH CORNER, EXCEPT 6" WALLS 1 - #5 DIAGONAL.
AT CORNERS AND INTERSECTIONS, EXTEND HORIZONTAL WALL STEEL TO 2" FROM OUTSIDE FACE AND LAP WITH ELBOW BARS (30 DIAMETERS) OF SAME SIZE AND SPACING. LAP OUTSIDE FACE ONLY AT CORNERS.
WALL STUBS SHALL PROJECT 27 DIAMETERS AND SHALL BE A MINIMUM OF 1'-6" LONG, SAME SIZE AND SPACING AS VERTICAL STEEL.
WHERE WALLS WITHOUT VERTICAL REINFORCING ARE POURED SEPARATE FROM FOOTING PROVIDE #4 x 1'-6" STUBS AT 18" O.C.

SLABS AND BEAMS

STEEL SHALL BE RIGIDLY SUPPORTED USING CONCRETE BLOCKS OR APPROVED CHAIRS. USE #5 RAISER BAR FOR ALL SLABS.
WHERE SLAB STEEL IS PARALLEL TO A BEAM OR WALL PROVIDE #4 x 5'-0" AT 12" O.C., IN TOP OF SLAB ACROSS BEAM OR WALL. WHERE SLAB IS ON ONE SIDE ONLY, TOP ELBOW BARS SHALL BE #4 x 3'-0" AT 12" O.C.

SLAB TEMPERATURE STEEL:

THICKNESS (T)	FLOOR	ROOF
5" OR LESS	#4 AT 18" O.C.	#4 AT 16" MIN.
6"	#4 AT 16" O.C.	#4 AT 13"
7" AND ABOVE	0.024T	0.03T

AT OPENINGS OVER 18" SQUARE, PROVIDE 2 BARS SAME SIZE AS MAIN STEEL EXTENDING 30 DIAMETERS PAST OPENING AT EACH SIDE AND DIAGONALLY AT CORNERS.
WHERE BEAM OR SLAB STEEL IS INDICATED AS BENT UP, IT SHALL BE BENT UP AT THE ONE-SIXTH POINT OF CLEAR SPAN FOR SIMPLE SUPPORTS AND ONE-FIFTH POINT FOR CONTINUOUS SUPPORTS EXTENDING INTO ADJACENT SPAN A DISTANCE EQUAL ONE-FOURTH GREATER SPAN.
NON STRUCTURAL SLABS ON GRADE TO BE 3½" THICK PLACED ON GRAVEL FILL AND REINFORCED WITH 6 x 6 6/6 MESH, UNLESS SHOWN OTHERWISE ON DRAWINGS.
COVERED WALK SLABS TO BE REINFORCED WITH 6x6 10/10 MESH.

MASONRY (f'_m = 1500 PSI FOR UNITS GROUTED SOLID; 1350 PSI ELSEWHERE)

CLAY BLOCK BEARING WALLS AND SHEAR WALLS TO BE PER SPECIFICATIONS.
CONCRETE BLOCK BEARING WALLS AND SHEAR WALLS TO BE LOAD BEARING GRADE "A" PER A.S.T.M. C90-59.
MASONRY TO BE LAID UP IN TYPE "S" MORTAR.
REINFORCE WALLS HORIZONTALLY WITH K-WEB (HEAVY DUTY), EMBEDDED IN MORTAR AT 24" O.C.; EMBED AT 16" O.C. FOR STACK BOND. LAP 12" MINIMUM AT SPLICES. AT CORNERS AND INTERSECTIONS CUT DIAGONAL WEB STEEL AND BEND WITH LONGITUDINAL BARS 12" AROUND CORNER; BLOCKS TO BE DOVETAILED TOGETHER.
SEE PLANS FOR BOND BEAM, LINTEL DETAILS, AND MASONRY REINFORCING.

CAVITY WALLS: TIES IN ALTERNATE COURSES SHALL BE STAGGERED. MAXIMUM VERTICAL DISTANCE BETWEEN TIES 1'-6". MAXIMUM HORIZONTAL DISTANCE 3'-0".
MASONRY VENEER WALLS: TIES TO MASONRY VENEER TO BE NO. 8 B. & S. GAUGE HARD DRAWN WIRE MINIMUM. EACH TIE SHALL SUPPORT NOT MORE THAN 2 SQUARE FEET OF WALL AREA AND MAXIMUM SPACING EQUAL 2'-0" O.C. HORIZONTAL.

STRUCTURAL STEEL

STRUCTURAL GRADE A.S.T.M. A-36, fs = 22,000 PSI. (24,000 PSI FOR COMPACT SECTIONS).
PIPE COLUMNS, A.S.T.M. A-53, GRADE B, YIELD STRESS 35,000 PSI.
ALL STEEL, EXCEPT STEEL EMBEDDED IN CONCRETE, SHALL BE GIVEN ONE SHOP COAT OF APPROVED PAINT.
WELDS 3/16" (MINIMUM) CONTINUOUS FILLET BY CERTIFIED WELDERS, HEAVY COATED ELECTRODES.
FIELD CONNECTIONS NOT SHOWN SHALL BE BOLTED FRAMED BEAM CONNECTIONS PER AISC.
FIELD BOLTS TO BE A-307.
DURING ERECTION, STRUCTURAL STEEL SHALL BE SECURED FROM COLLAPSING WITH TEMPORARY BRACING.
WHERE EXPANSION ANCHORS ARE SPECIFIED, THE CONTRACTOR SHALL SUBMIT TO THE STRUCTURAL ENGINEER A SAMPLE OF THE ANCHOR TO BE USED WITH LABORATORY DATA OF PULL-OUT AND SHEAR STRENGTH.

STEEL JOISTS

THE DESIGN, DETAILS AND FABRICATION PER SJI/AISC SPECIFICATIONS.
JOIST MANUFACTURER TO SUBMIT SHOP DRAWINGS TO THE ARCHITECT FOR APPROVAL.
BRIDGING TO BE LOCATED IN ALL JOIST SPANS IN ACCORDANCE WITH SJI/AISC SPACING UNLESS SHOWN OTHERWISE ON PLANS.
BEARING, ANCHORAGE AND STRUT BRIDGING DESIGN TO BE AS SPECIFIED IN SJI/AISC SPECIFICATIONS.
SLOPED CHORD JOIST TO BE DESIGNED BY FABRICATOR IN ACCORDANCE WITH GENERAL SPECIFICATIONS.
PROVIDE CEILING EXTENSIONS WHERE REQUIRED. (SEE ARCHITECT'S PLANS).

STEEL DECK

SHALL BE DESIGNED, MANUFACTURED AND INSTALLED PER METAL ROOF DECK INSTITUTE SPECIFICATIONS TO SUPPORT SUPERIMPOSED LOAD AT A MAXIMUM LIVE LOAD DEFLECTION OF L/240.
ANCHORAGE TO SUPPORTS TO BE SUFFICIENT TO RESIST A 30 PSF UPLIFT.
WELDING PATTERN AT THE SUPPORTS, PERIMETER AND FOR DIAPHRAGM ACTION TO RESIST A MINIMUM LATERAL SHEAR FORCE OF 250 LBS. PER LINEAL FOOT TO BE SUBMITTED TO THE ARCHITECT FOR APPROVAL.
SEE DRAWINGS FOR SHEAR FORCES TO BE RESISTED.
MANUFACTURER TO PROVIDE STEEL HEADER AT OPENINGS THROUGH DECK TO SATISFACTORILY DISTRIBUTE LOADS TO SUPPORTING MEMBERS.

TIMBER

STRUCTURAL TIMBER AND LUMBER 1500 PSI STRESS GRADE DOUGLAS FIR (CONSTRUCTION OR INDUSTRIAL GRADE) PARAGRAPHS 122B THROUGH 125B AND 153B W.C.L.A. GRADING RULES #15.
PROVIDE DOUBLE JOISTS UNDER PARTITIONS THAT EXTEND AT LEAST HALF JOIST SPAN.
BOLT HEADS AND NUTS BEARING AGAINST WOOD TO BE PROVIDED WITH M. I. WASHERS EXCEPT ON SILL PLATES AND STEEL BEAM NAILERS USE CUT WASHERS.
NAILERS TO STEEL BEAMS SHALL BE ATTACHED WITH 5/8" BOLTS AT 3'-0" O.C. STAGGERED.
WOOD BEARING ON OR INSTALLED WITHIN 1" OF MASONRY OR CONCRETE TO BE TREATED WITH AN APPROVED PRESERVATIVE.
SOLID BLOCKING OF NOT LESS THAN 2" THICKNESS SHALL BE PROVIDED AT ENDS AND AT ALL SUPPORTS OF JOISTS AND RAFTERS. BETWEEN SUPPORTS PROVIDE BLOCKING OR APPROVED BRIDGING AT 8'-0" O.C. FOR JOISTS, 10'-0" FOR RAFTERS.

GLUE-LAM MEMBERS

GLUED LAMINATED BEAMS, DOUGLAS FIR DRIED TO A MOISTURE CONTENT 8 TO 12%. STRESS GRADE COMBINATION "A" OR BETTER.
GLUE SHALL BE CASEIN, WATER RESISTANT TYPE AND SHALL COMPLY WITH FEDERAL SPECIFICATION MMM-A-125, AND SHALL CONTAIN A MOLD INHIBITOR. SEE ARCHITECT'S SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
LOCATIONS FOR USE OF WATERPROOF GLUE SHOWN ON DRAWINGS.
GLUE-LAM MEMBERS TO BE A.I.T.C. CERTIFIED. THE FABRICATOR SHALL BE APPROVED BY THE ARCHITECT.

PLYWOOD

PLYWOOD ROOF AND WALL SHEATHING TO BE CD GRADE PLYSCORD. MINIMUM PLYWOOD NAILING TO BE 6" O.C. AT ALL SUPPORTED OR BLOCKED PANEL EDGES AND 12" O.C. AT INTERIOR SUPPORTS. NAILS TO BE 8d FOR 1/2" PLYWOOD, 10d FOR 5/8" AND 3/4" PLYWOOD. [illegible] NOTED OTHERWISE ON DWGS. PLYWOOD SHTS. TO BE STAGGERED.

WOOD AND STEEL OPEN WEB JOISTS

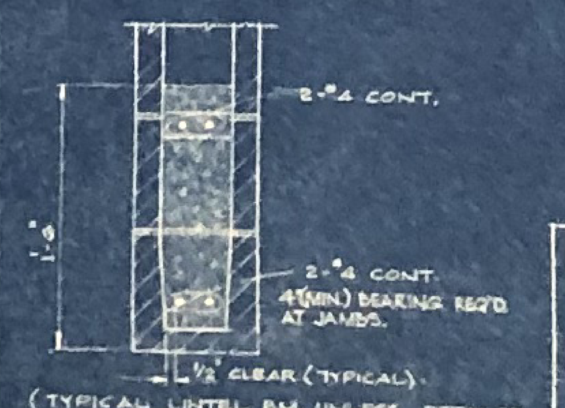
JOISTS SHOWN ON PLANS AS "TJ" TO BE "TRUS-JOISTS" OR APPROVED EQUAL. SYSTEM TO BE TESTED AND APPROVED UNDER U.B.C. TESTING PROCEDURES.
CHORDS TO BE STRESS GRADE LUMBER. WEB MEMBERS TO BE COLD ROLLED STEEL TUBING. JOISTS TO BE CAMBERED FOR DEAD LOAD ONLY. D.L. = 15 PSF.
COMPLETE JOIST DESIGNS BEARING THE STAMP OF A REGISTERED PROFESSIONAL ENGINEER TO BE SUBMITTED TO THE ARCHITECT FOR APPROVAL BASED ON A DEAD LOAD OF 17 PSF AND THE DESIGN LIVE LOAD.
JOIST MANUFACTURER SHALL PROVIDE ALL SPECIALTY ITEMS REQUIRED FOR A NORMAL AND COMPLETE INSTALLATION OF THE JOISTS.

T & G DECK

ALL BOARDS TO BEAR ON AT LEAST ONE SUPPORTING MEMBER. EVERY THIRD BOARD TO BE CONTINUOUS BETWEEN SUPPORTS. LENGTHS OF INTERMEDIATE BOARDS TO BE SELECTED SO THAT JOINTS IN ADJACENT BOARDS ARE AT LEAST 4'-0" APART. (MINIMUM LENGTH 8'-0").
DECKING TO BE NAILED WITH ONE 20d BLIND AND ONE 20d FACE NAIL AT EACH SUPPORT.
ALL T & G TO BE DOUGLAS FIR, "SELECT DEX" PARAGRAPH 127B, W.C.L.A. RULES #15.

MASONRY NOTES.

1. ALL 8" MASONRY WALLS TO BE REINF. W/ #6 VERTS. @ 4'-0" o.c. & 6" WALLS W/ #5 VERTS. @ 4'-0" o.c. ALL WALLS W/ FTGS TO BE REINF.
2. ALL JAMBS TO BE REINF W/ ONE REBAR OF SAME SIZE AS TYP. WALL VERTS.
3. ALL MASONRY WALLS USED TO SUPPORT BEAMS TO HAVE THE 3 VERT. CELLS NEAREST BM. REINF. W/ REBARS OF SAME SIZE AS TYP. WALL VERTS.. WHERE BMS. ARE POCKETED INTO WALL, JAMBS OF POCKET TO BE REINF. ALSO.
4. ALL MASONRY WALLS TO HAVE CONTINUOUS 8" HIGH BOND BEAMS AT DOOR/WINDOW HEAD HEIGHT, AT TOP OF WALL & AT A POINT MIDWAY BETWEEN THESE TWO LOCATIONS IN WALL OVER 12' HIGH. SEE DETAILS 1, 2, & 3 THIS SHT.
5. SPECIAL MASONRY REINFORCING IS SHOWN ELSEWHERE IN STRUCTURAL DRAWINGS. & SUPERCEDES THE ABOVE TYP. REINF. NOTES.
6. ALL BOND BMS. LINTEL BMS. & REINFORCED VERTICAL CELLS TO BE FILLED WITH POURED COURSE GROUT, f'c = 2000 PSI, COMPLYING WITH U.B.C. SEC. 2403 (S). (GRAVEL AGGR. TO BE 3/8" MINUS).
7. ALL MASONRY CONSTRUCTION TO CONFORM TO U.B.C. SEC. 2415.
8. SPECIAL INSPECTION WILL BE REQUIRED FOR REINFORCED MASONRY COLUMNS, LINTELS SUPPORTING CONCENTRATED LOADS, BEARING PLATES SET IN WALLS SUPPORTING GLULAM BEAMS, BOND BEAMS AND ANY REINFORCED CELL GROUT POURS.
9. WHERE MASONRY COLUMN SPLICES OCCUR, PROVIDE #2 TIES @ 4" O.C.



(TYPICAL LINTEL BM. UNLESS DETAILED OTHERWISE)
TYPICAL MASONRY LINTEL 6
1½" = 1'-0"

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SNOHOMISH COUNTY, WASHINGTON

GENERAL NOTES
SOILS LOGS
TYPICAL DETAILS

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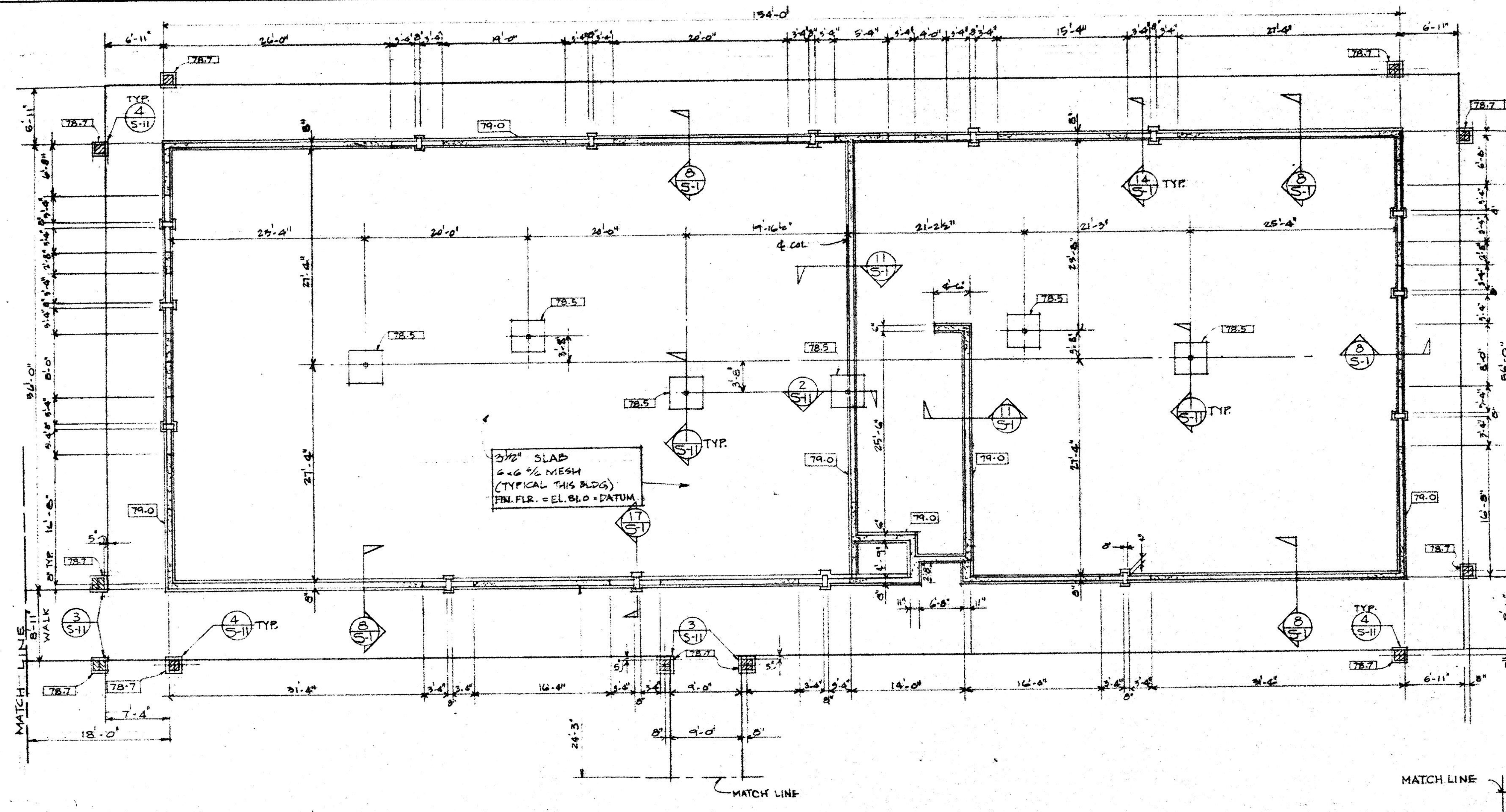
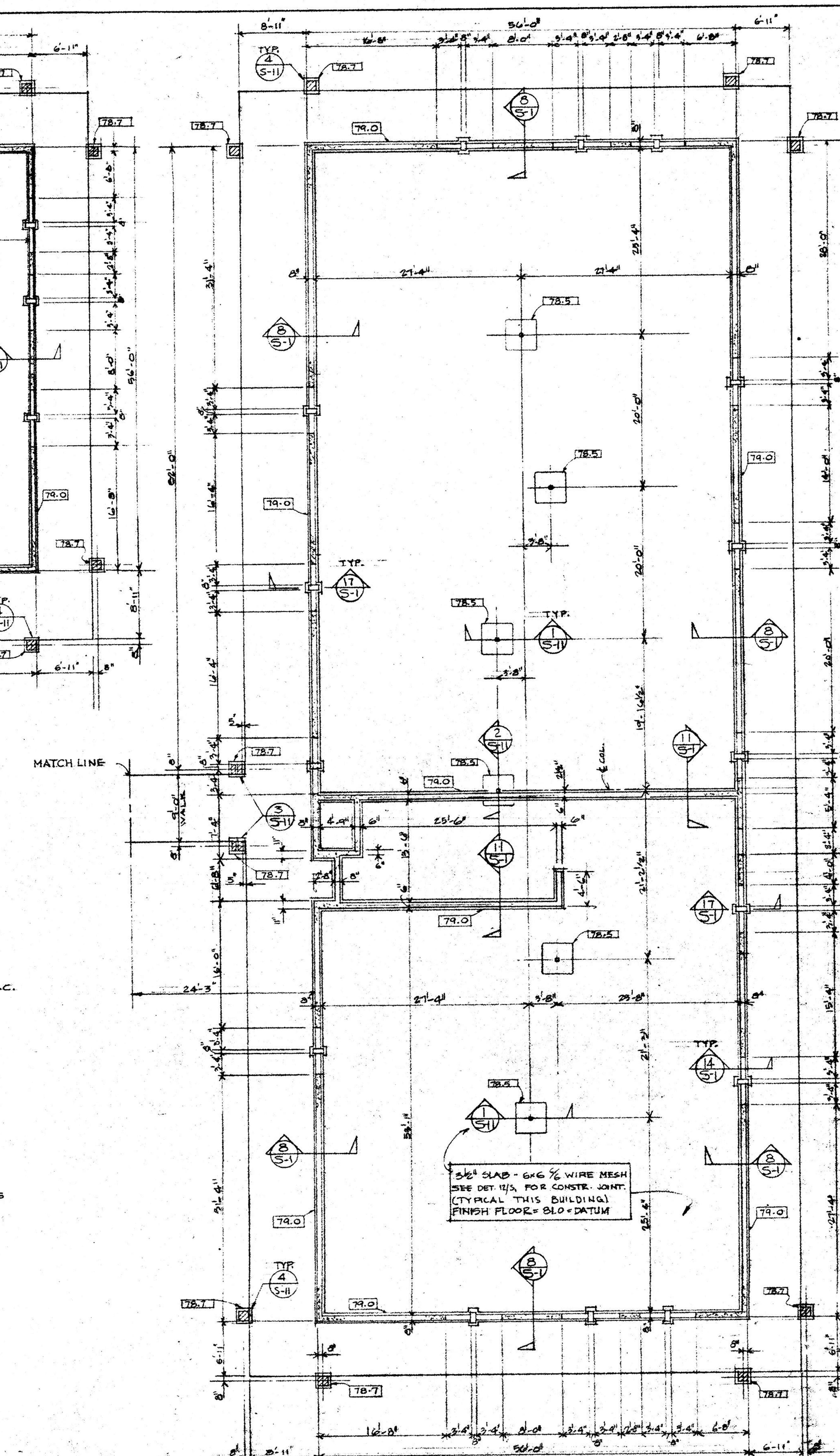
ARCHITECTS

S 1



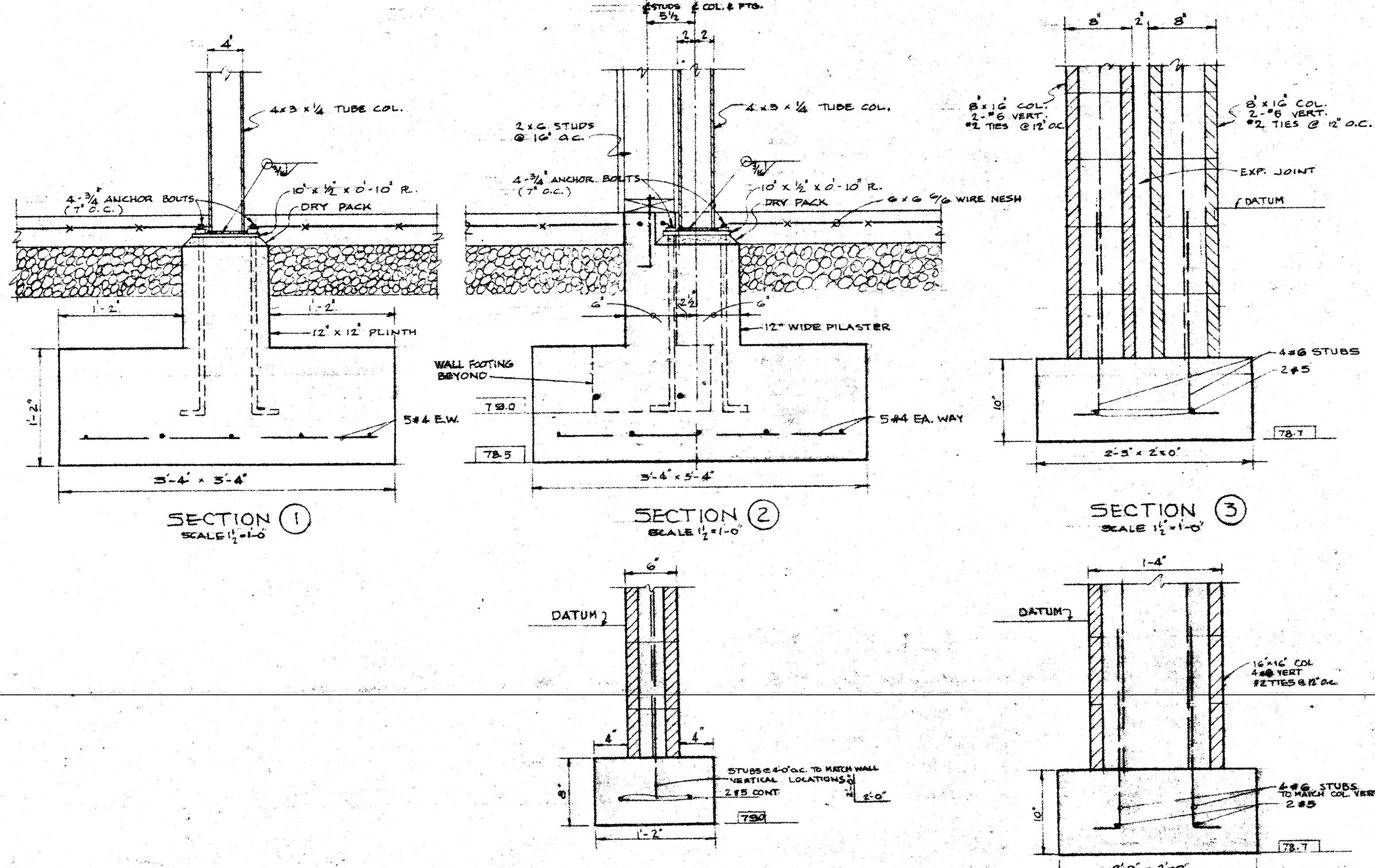
FOUNDATION PLAN - BUILDING 'G'
SCALE: 1/8" = 1'-0"

BOTTOM FTG. ELEV. [82.0] → AS SHOWN
FINISH FLOOR = 81.00 = DATUM



FOUNDATION PLAN - BUILDING 'H'
SCALE: 1/8" = 1'-0"

FINISH FLOOR = 81.00 = DATUM
BOTTOM FTG. ELEV. [ ] = AS SHOWN
SCALE: 1/8" = 1'-0"



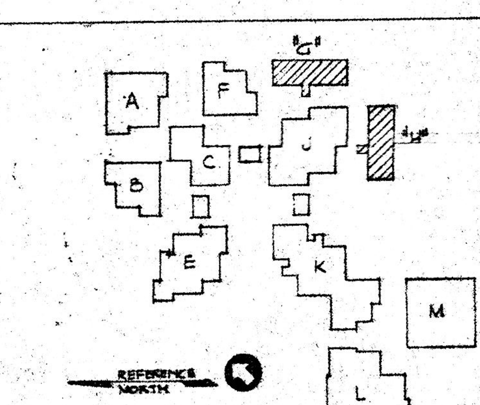
SECTION 1 SCALE 1 1/2" = 1'-0"

SECTION 2 SCALE 1 1/2" = 1'-0"

SECTION 3 SCALE 1 1/2" = 1'-0"

SECTION 5 SCALE 1 1/2" = 1'-0"

DETAIL 4 SCALE 1 1/2" = 1'-0"



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MARYSVILLE SCHOOL DISTRICT 25
SNOHOMISH COUNTY, WASHINGTON

BLDG. "G" & "H"
FOUNDATION PLAN DETAILS

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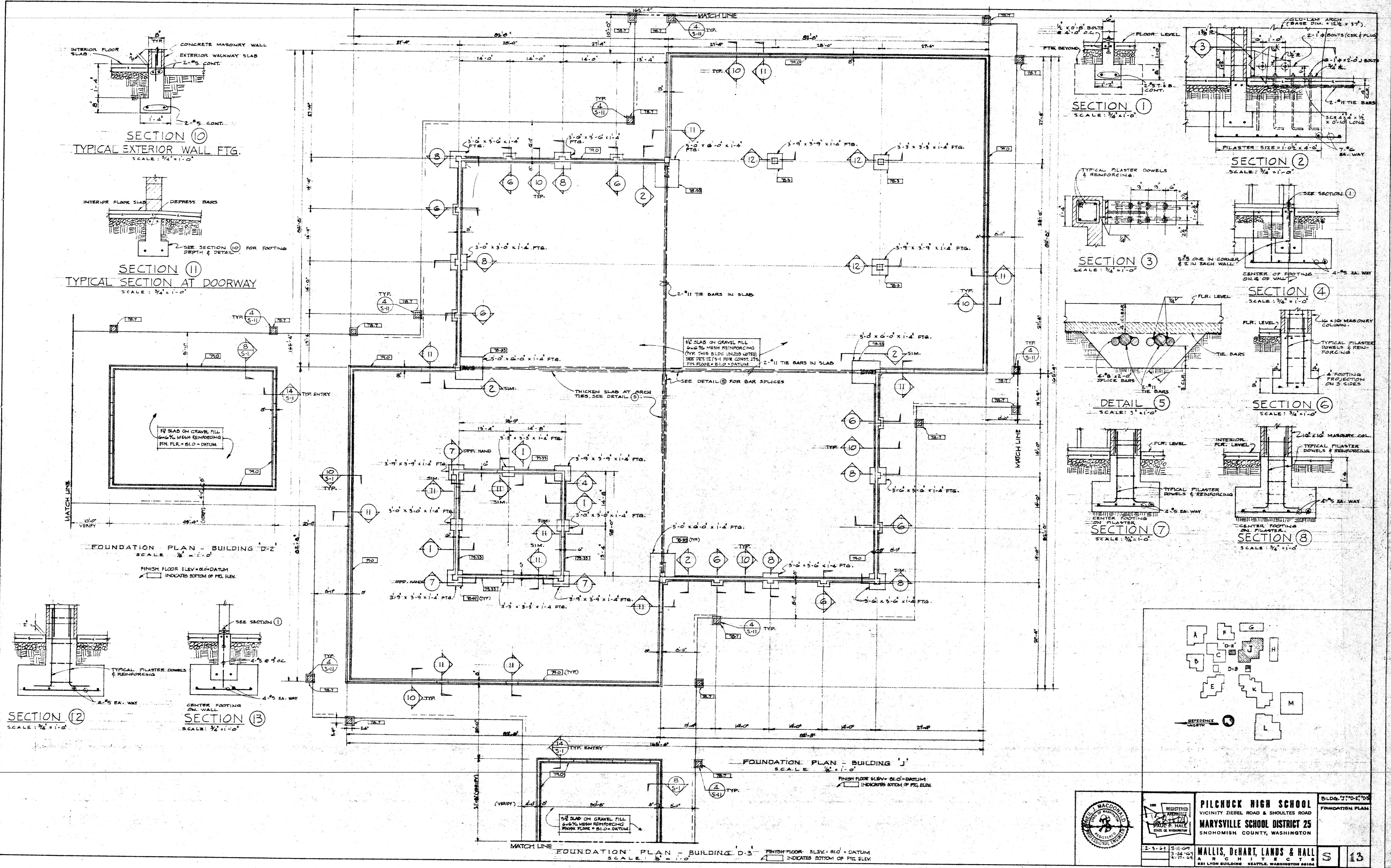
S 11


SECTION 10
TYPICAL EXTERIOR WALL FTG.
SCALE: 3/4" = 1'-0"
SECTION 11
TYPICAL SECTION AT DOORWAY
SCALE: 3/4" = 1'-0"
FOUNDATION PLAN - BUILDING 'D-2'
SCALE: 1/8" = 1'-0"
FINISH FLOOR ELEV = 81.0 = DATUM
INDICATES BOTTOM OF FTG. ELEV.
SECTION 12
SCALE: 3/4" = 1'-0"
SECTION 13
SCALE: 3/4" = 1'-0"
MATCH LINE
FOUNDATION PLAN - BUILDING 'J'
SCALE: 1/8" = 1'-0"
FINISH FLOOR ELEV = 81.0' = DATUM
INDICATES BOTTOM OF FTG. ELEV.
FOUNDATION PLAN - BUILDING 'D-3'
SCALE: 1/8" = 1'-0"
FINISH FLOOR ELEV. = 81.0' = DATUM
INDICATES BOTTOM OF FTG. ELEV.
5 1/2" SLAB ON GRAVEL FILL 6-6-6/6 MESH REINFORCING (TYP. THIS BLDG UNLESS NOTED) SEE DETS 12/S-1 FOR CONST. JTS. FIN. FLOOR = 81.0 = DATUM
THICKEN SLAB AT ARCH TIES, SEE DETAIL 5
SEE DETAIL 5 FOR BAR SPLICES
2-#11 TIE BARS IN SLAB
SECTION 1
SCALE: 3/4" = 1'-0"
SECTION 2
SCALE: 3/4" = 1'-0"
SECTION 3
SCALE: 3/4" = 1'-0"
SECTION 4
SCALE: 3/4" = 1'-0"
DETAIL 5
SCALE: 3" = 1'-0"
SECTION 6
SCALE: 3/4" = 1'-0"
SECTION 7
SCALE: 3/4" = 1'-0"
SECTION 8
SCALE: 3/4" = 1'-0"
REFERENCE NORTH
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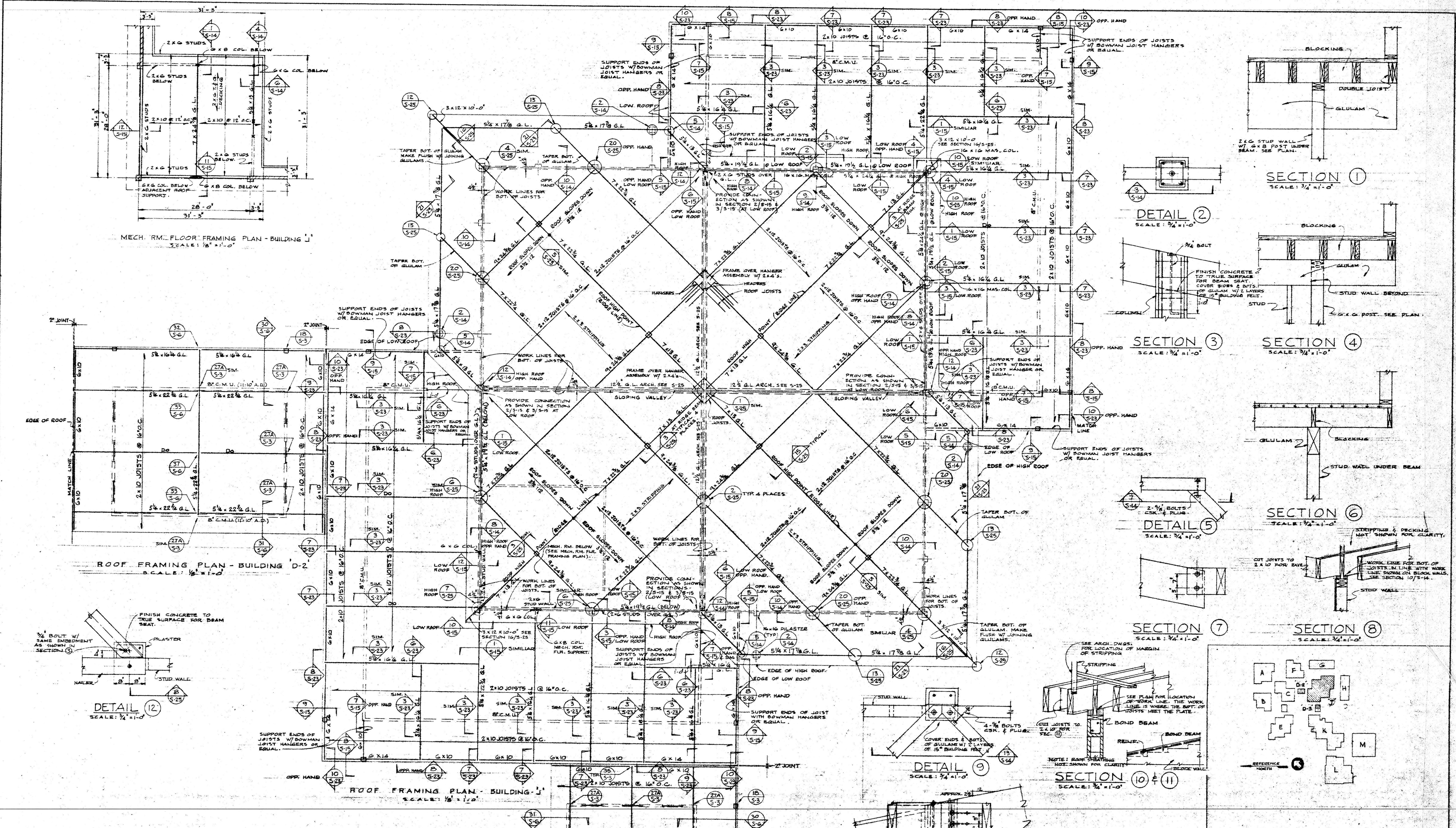
BLDG. "J", "D-2", "D-3"
FOUNDATION PLAN
S 13



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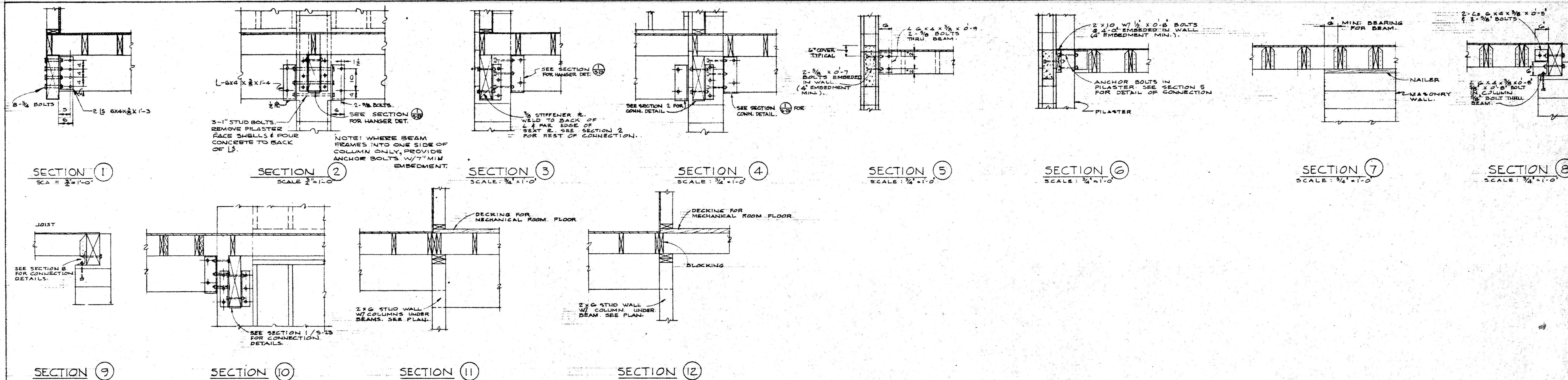
BLDG "J", "D-2", "D-3"
ROOF FRAMING PLAN, DETAILS

S 14



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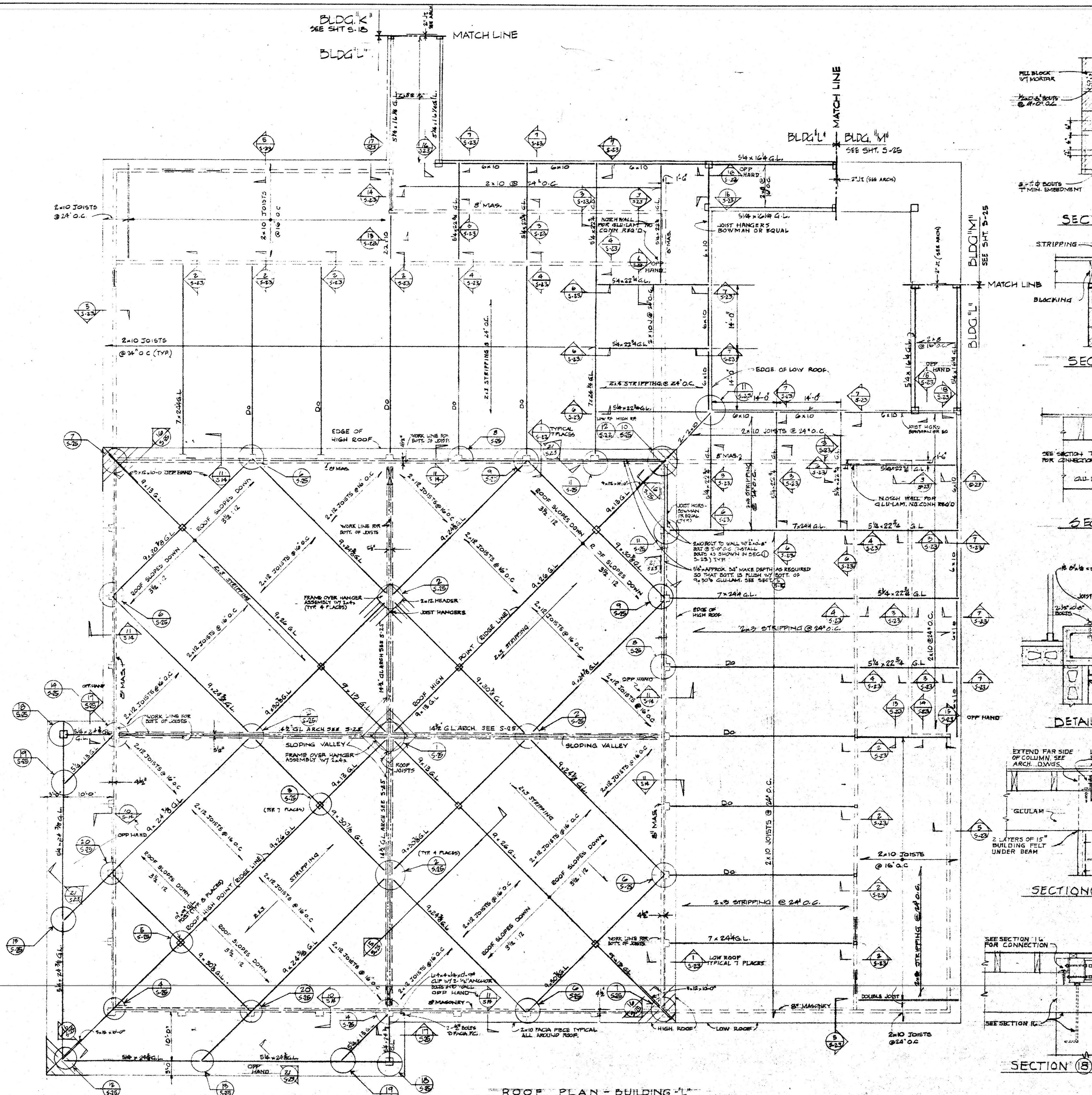
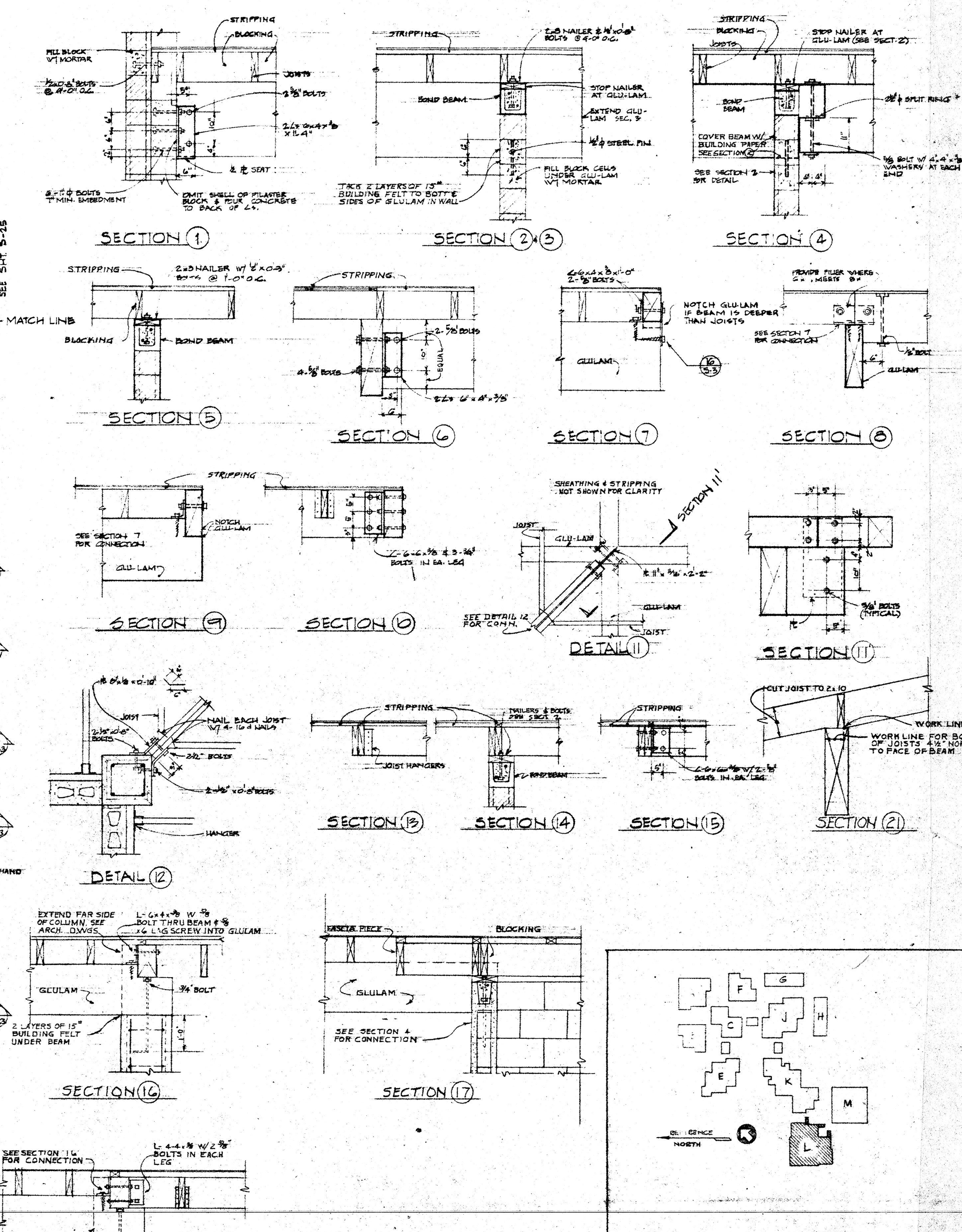
BLDG "J"

SECTIONS & DETAILS

S 15





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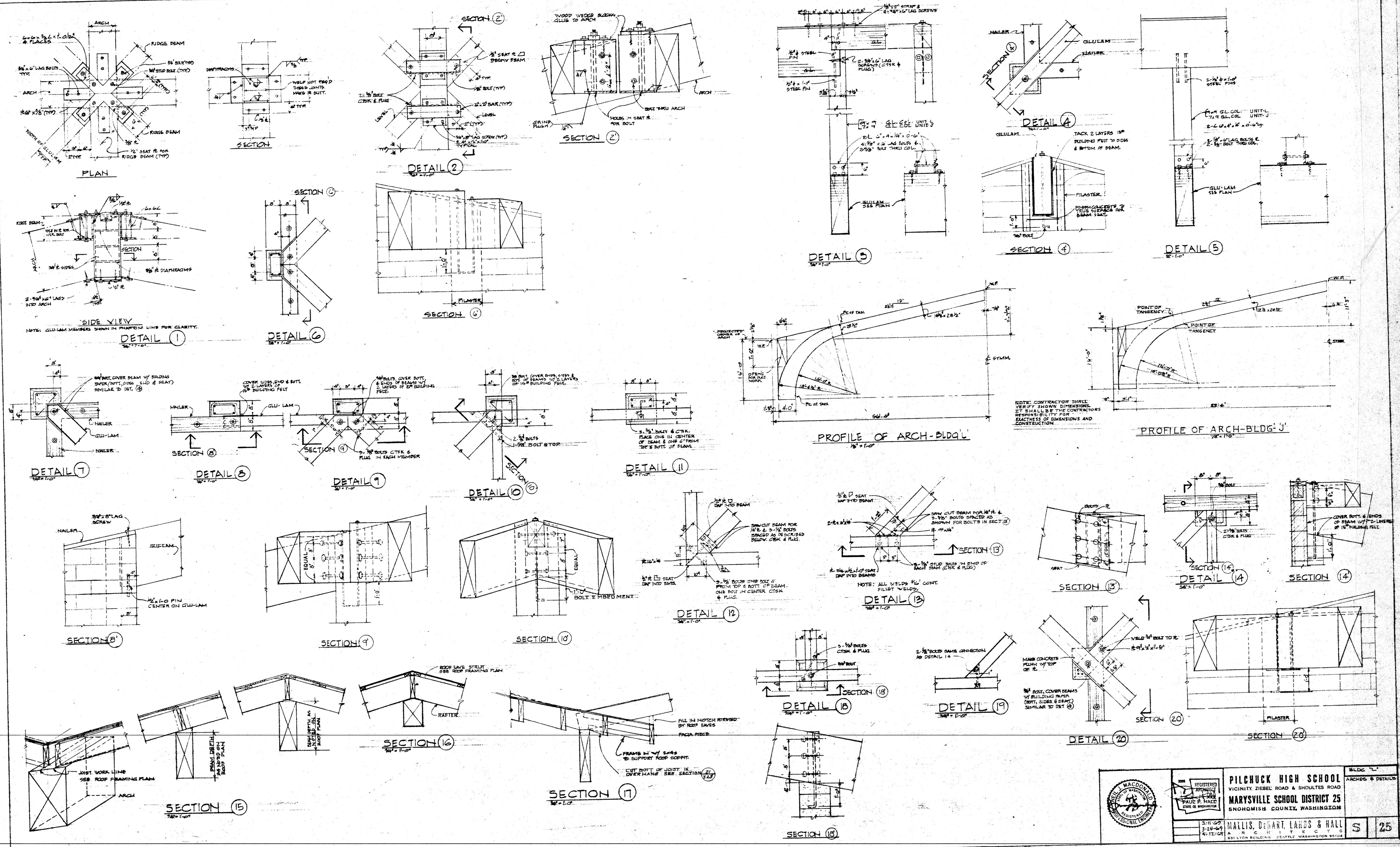
BLDG "L"
ROOF PLAN

S 23



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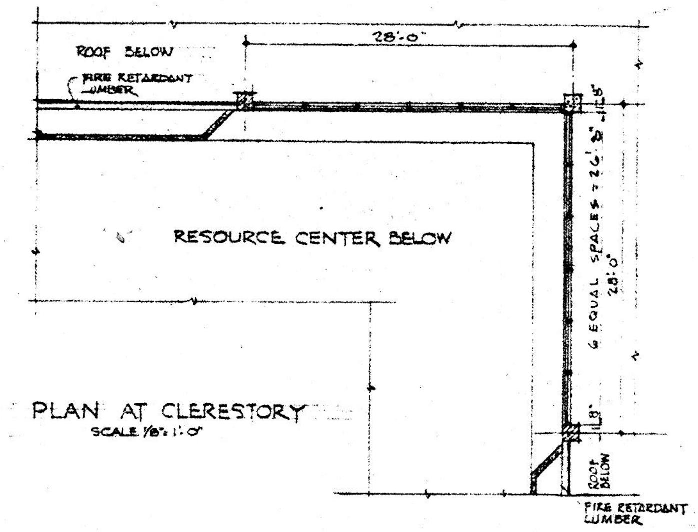
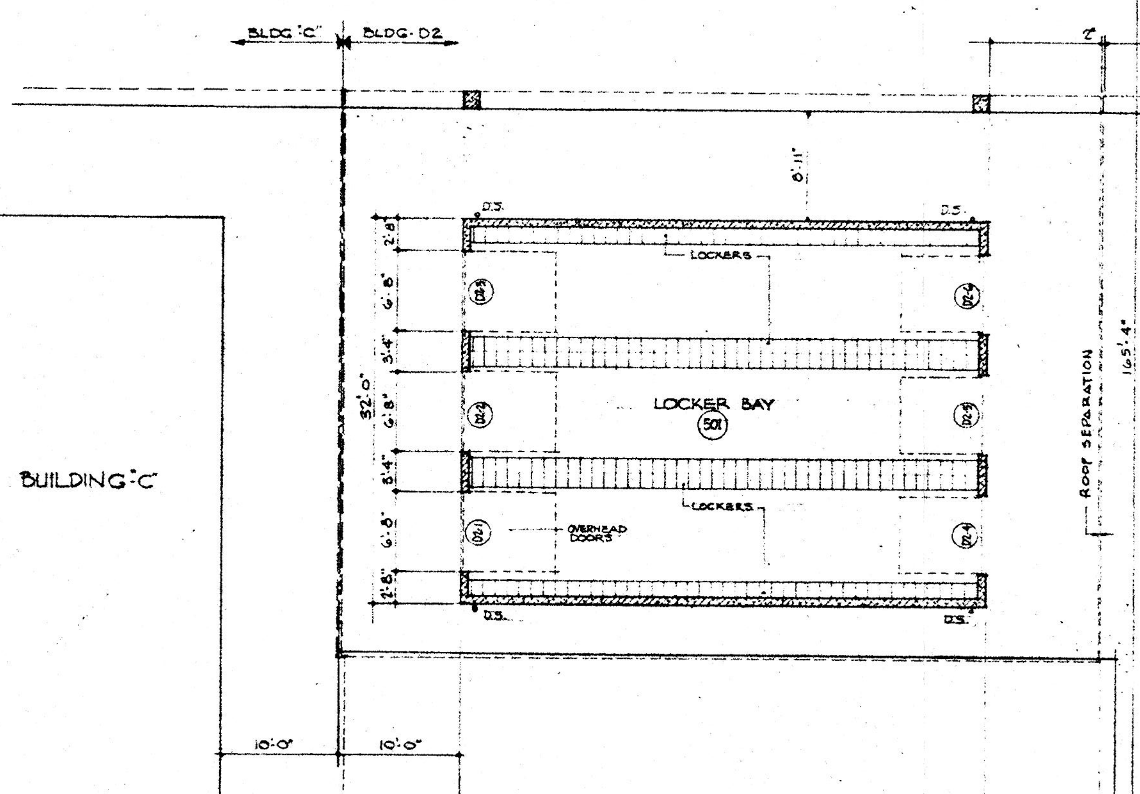
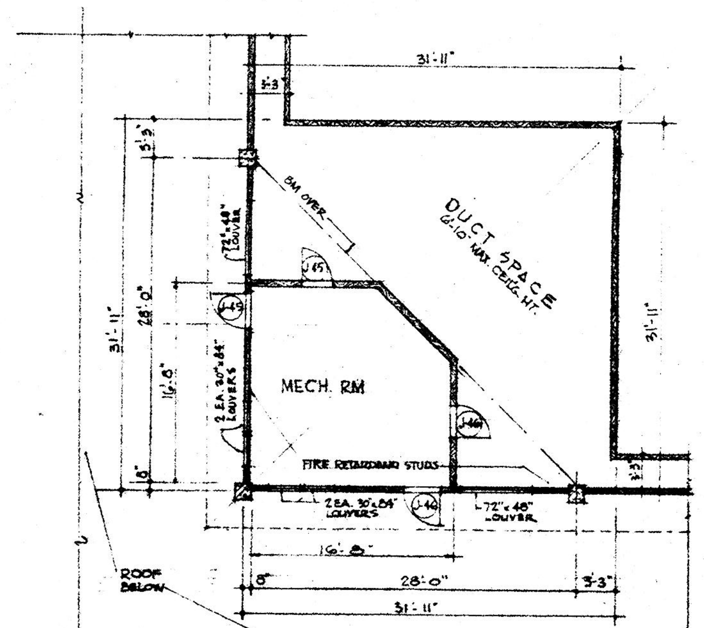
S 25



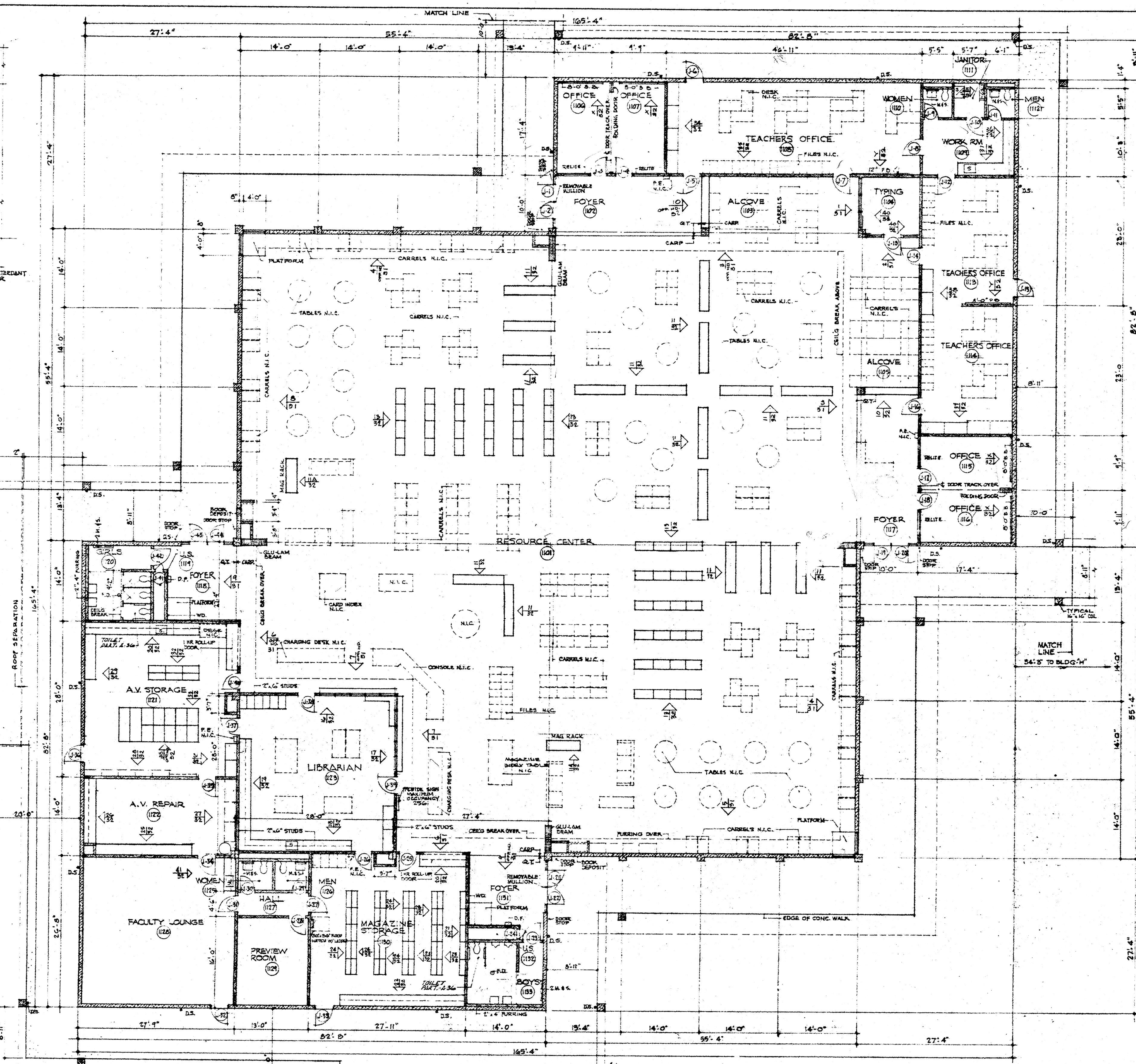
PLAN AT CLERESTORY
SCALE 1/8" = 1'-0"



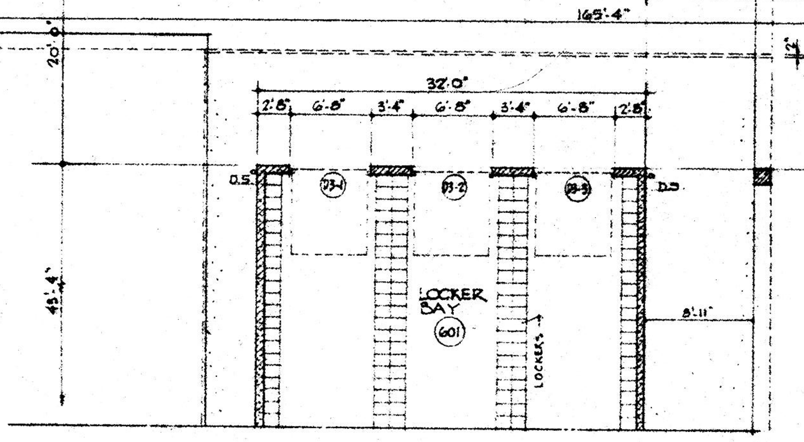
FLOOR PLAN - LOCKER BAY - BUILDING D-2
SCALE 1/8" = 1'-0"



PLAN - MECHANICAL ROOM
SCALE 1/8" = 1'-0"



FLOOR PLAN - M.C. BUILDING "J"
SCA.



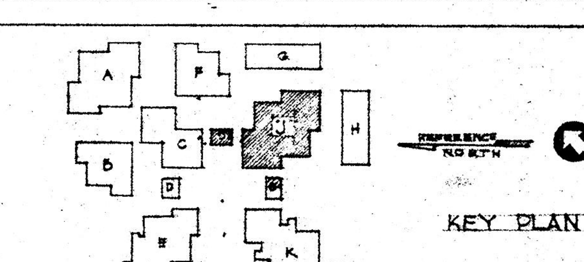
FLOOR PLAN - LOCKER BAY - BLDG "D-3"
SCALE 1/8" = 1'-0"
SEE SHEET A-11 FOR PORTION OF LOCKER BAY "D-3"

ROOM LIST AND FINISH SCHEDULE

ROOM		FLOOR	BASE	WAINSCOT MAT'L	WAINSCOT FIN.	WAINSCOT HEIGHT	WALL MAT'L	WALL FIN.	CEILING MAT'L & TYPE		CEILING HEIGHT	CEILING FIN.	REMARKS
BUILDING "J"													
1101	RESOURCE CENTER	CARPET	R	—	—	—	C.M.U. G.W.B.	E	G.W.B. AC.T.	D	VARIES	P*	* G.W.B. ONLY
1102	FOYER	Q.T.	R	—	—	—	C.M.U. G.W.B.	E	AC.T.	B	9'-0"	P	
1103	ALCOVE	CARPET	R	—	—	—	C.M.U. G.W.B.	E	AC.T.	B	9'-0"	P	
1104	TYPING	CARPET	R	—	—	—	C.M.U. G.W.B.	E	G.W.B.	B	9'-0"	P	
1105	ALCOVE	CARPET	R	—	—	—	C.M.U. G.W.B.	E	AC.T.	B	9'-0"	P	
1106	OFFICE	CARPET	R	—	—	—	C.M.U. G.W.B.	E	G.W.B.	A	9'-0"	P	
1107	OFFICE	CARPET	R	—	—	—	C.M.U. G.W.B.	E	G.W.B.	A	9'-0"	P	
1108	TEACHERS	CONC.	R	—	—	—	C.M.U. G.W.B.	E	AC.T.	A	9'-0"	—	
1109	WORK ROOM	CONC.	R	—	—	—	C.M.U. G.W.B.	E	AC.T.	A	9'-0"	—	
1110	WOMEN	C.T.	C.T.	—	—	—	G.W.B.	*	AC.T.	B	8'-0"	—	* PLASTIC
1111	JANITOR	CONC.		—	—	—	C.M.U. G.W.B.	E	G.W.B.	B	8'-0"	P	
1112	MEN	C.T.	C.T.	—	—	—	C.M.U. G.W.B.	*	AC.T.	B	8'-0"		* PLASTIC
1113	TEACHERS	CONC.	R	—	—	—	C.M.U. G.W.B.	E	AC.T.	A	9'-0"		
1114	TEACHERS	CONC.	R	—	—	—	C.M.U. G.W.B.	E	AC.T.	A	9'-0"		
1115	OFFICE	CARPET	R.	—	—	—	C.M.U. G.W.B.	E	G.W.B.	A	9'-0"		
1116	OFFICE	CARPET	R.	—	—	—	C.M.U. G.W.B.	E	G.W.B.	A	9'-0"		
1117	FOYER	Q.T.	R.	—	—	—	C.M.U. G.W.B.	E	AC.T.	B	9'-0"	P	
1118	FOYER	Q.T.	R.	WOOD	S.	7'-2"	C.M.U. G.W.B.	E	AC.T.	B	9'-0"		
1119	U.S.	CONC.		—	—	—	G.W.B.	E	G.W.B.	B	9'-0"	—	
1120	GIRLS	C.T.	C.T.	—	—	—	G.W.B.*	**	AC.T.	B	9'-0"		* ON 3/8" W.P. PLYWD ** PLASTIC
1121	A.V. STORAGE	CONC.	R	—	—	—	C.M.U. G.W.B.	E	AC.T.	A	9'-0"		
1122	A.V. REPAIR	CONC.	R	—	—	—	C.M.U. G.W.B.	E	AC.T.	A	9'-0"		
1123	LIBRARIAN	CONC.	R	—	—	—	C.M.U. G.W.B.	E	AC.T.	A	9'-0"		
1125	WOMEN	C.T.	C.T.	—	—	—	G.W.B.*	**	AC.T.	B	8'-0"		
1126	MEN	C.T.	C.T.	—	—	—	G.W.B.	E	AC.T.	B	8'-0"		
1127	HALL	CONC.	R	—	—	—	G.W.B.	E	AC.T.	B	8'-0"		
1128	FACULTY LOUNGE	CONC.	R	—	—	—	C.M.U. G.W.B.	E	AC.T.	A	9'-0"		
1129	PREVIEW RM	CONC.	R	—	—	—	C.M.U. G.W.B.	E	AC.T.	A	9'-0"		
1130	MAGAZINE STOR.	CONC.	R	—	—	—	C.M.U. G.W.B.	E	AC.T.	A	9'-0"		
1131	FOYER	Q.T.	Q.T.	WOOD	S.	7'-2"	C.M.U. G.W.B.	E	AC.T.	B	9'-0"	P	
1132	U.S.	CONC.		—	—	—	G.W.B.	—	G.W.B.	B	9'-0"		
1133	BOYS	C.T.	C.T.	—	—	—	G.W.B.*	**	AC.T.	B	9'-0"		* ON 3/8" W.P. PLYWD. ** PLASTIC
1134	MECH RM.	WOOD		—	—	—	G.W.B.	—	G.W.B.		VARIES		
BUILDING D-2													
501	LOCKER BAY	CONC.		—	—	—	C.M.U.		AC.T.	G	VARIES		
BUILDING D-3													
601	LOCKER BAY	CONC.		—	—	—	C.M.U.		AC.T.	G	VARIES		

DOOR AND FRAME SCHEDULE

OPENING	DOOR SIZE	DOOR THICK	DOOR GLASS	DOOR TYPE	DOOR MAT'L	FRAME MAT.	FRAME HEAD	FRAME JAMB	FRAME MULL	FRAME THRESH	REMARKS
BUILDING J											
J-1	3'-0"x7'-0"	1 3/4"	SAFETY	B	H.M.	H.M.	1/26	6/26 4/26	8/26	7/26	
J-2	3'-0"x7'-0"	1 3/4"	SAFETY	B	H.M.	H.M.	1/26	6/26 4/26	8/26	7/26	
J-3	3'-0"x7'-0"	1 3/4"	WIRE	C *	WOOD	WOOD	1/27	1/27 4/27	—	—	* 12"x12" LOUVER
J-4	3'-0"x7'-0"	1 3/4"	WIRE	C *	WOOD	WOOD	1/27	1/27 4/27	—	—	* 12"x12" LOUVER
J-5	3'-0"x7'-0"	1 3/4"	WIRE	C *	WOOD	WOOD	1/27	1/27	—	—	* 24"x24" LOUVER
J-6	3'-0"x7'-0"	1 3/4"	SAFETY	B	H.M.	H.M.	5/26	4/26	—	7/26	
J-7	3'-0"x7'-0"	1 3/4"	WIRE	C *	WOOD	WOOD	1/27	1/27	—	—	* 24"x24" LOUVER
J-8	3'-0"x7'-0"	1 3/4"	—	A	WOOD	WOOD	1/27	1/27	—	—	
J-9	2'-4"x7'-0"	1 3/4"	—	A *	WOOD	WOOD	1/27	1/27	—	—	* UNDERCUT DOOR
J-10	3'-0"x7'-0"	1 3/4"	—	A *	WOOD	WOOD	1/27	1/27	—	—	* UNDERCUT DOOR
J-11	2'-4"x7'-0"	1 3/4"	—	A *	WOOD	WOOD	1/27	1/27	—	—	* UNDERCUT DOOR
J-12	3'-0"x7'-0"	1 3/4"	—	A	WOOD	WOOD	1/27	1/27 4/27	—	—	
J-13	3'-0"x7'-0"	1 3/4"	WIRE	D *	WOOD	WOOD	1/27	1/27	—	—	* UNDERCUT DOOR
J-14	3'-0"x7'-0"	1 3/4"	WIRE	C *	WOOD	WOOD	1/27	1/27	—	—	* 24"x24" LOUVER
J-15	3'-0"x7'-0"	1 3/4"	SAFETY	B	H.M.	H.M.	5/26	4/26	—	7/26	
J-16	3'-0"x7'-0"	1 3/4"	WIRE	C *	WOOD	WOOD	1/27	1/27	—	—	* 24"x24" LOUVER
J-17	3'-0"x7'-0"	1 3/4"	WIRE	C *	WOOD	WOOD	1/27	1/27 4/27	—	—	* 12"x12" LOUVER
J-18	3'-0"x7'-0"	1 3/4"	WIRE	C *	WOOD	WOOD	1/27	1/27 4/27	—	—	* 12"x12" LOUVER
J-19	3'-0"x7'-0"	1 3/4"	SAFETY	B	H.M.	H.M.	1/26	6/26 11/26	11/26	7/26	
J-20	3'-0"x7'-0"	1 3/4"	SAFETY	B	H.M.	H.M.	1/26	6/26 11/26	11/26	7/26	
J-21	3'-0"x7'-0"	1 3/4"	SAFETY	B	H.M.	H.M.	1/26	6/26 8/26	8/26	7/26	
J-22	3'-0"x7'-0"	1 3/4"	SAFETY	B	H.M.	H.M.	1/26	6/26 8/26	8/26	7/26	
J-23	3'-0"x7'-0"	1 3/4"	—	A *	WOOD	WOOD	1/27	1/27	—	—	* 16"x16" LOUVER
J-24	1'-8"x4'-0"	—	—	—	METAL	—	9/26	9/26	—	9/27	"MILCOR" ACCESS DOOR
J-25	3'-0"x7'-0"	1 3/4"	—	A *	WOOD	WOOD	16/27	16/27	—	—	* 24"x24"-125° FUSIBLE LINK LOUVER
J-26	3'-0"x7'-0"	1 3/4"	WIRE	C	WOOD	WOOD	16/27	6/27	—	—	
J-27	3'-0"x7'-0"	1 3/4"	—	A	WOOD	WOOD	1/27	1/27	—	—	
J-28	3'-0"x7'-0"	1 3/4"	—	A *	WOOD	WOOD	1/27	1/27	—	—	* 16"x16" LOUVER
J-29	2'-6"x7'-0"	1 3/4"	—	A *	WOOD	WOOD	1/27	1/27	—	—	* UNDERCUT DOOR
J-30	2'-6"x7'-0"	1 3/4"	—	A *	WOOD	WOOD	1/27	1/27	—	—	* UNDERCUT DOOR
J-31	3'-0"x7'-0"	1 3/4"	—	A	WOOD	WOOD	1/27	1/27	—	—	
J-32	3'-0"x7'-0"	1 3/4"	—	A	H.M.	H.M.	5/26	4/26	—	7/26	
J-33	3'-0"x7'-0"	1 3/4"	—	A	H.M.	H.M.	5/26	4/26		7/26	
J-34	3'-0"x7'-0"	1 3/4"	—	A	WOOD	WOOD	16/27	16/27	—	—	
J-35	3'-0"x7'-0"	1 3/4"	—	A *	WOOD	WOOD	16/27	16/27	—	—	* 24"x18"-125° FUSIBLE LINK LOUVER
J-36	3'-0"x7'-0"	1 3/4"	—	A	H.M.	H.M.	5/26	6/26	—	7/26	
J-37	3'-0"x7'-0"	1 3/4"	WIRE	C	WOOD	WOOD	16/27	6/27	—	—	
J-38	3'-0"x7'-0"	1 3/4"	WIRE	D *	WOOD	WOOD	2/27	2/27	—	—	* 18"x18" LOUVER
J-39	3'-0"x7'-0"	1 3/4"	WIRE	D *	WOOD	WOOD	2/27	2/27	—	—	* 18"x18" LOUVER
J-40	3'-0"x7'-0"	1 3/4"	—	A *	WOOD	WOOD	1/27	1/27	—	—	* 24"x40"-125° FUSIBLE LINK LOUVER
J-41	1'-8"x7'-0"	—	—	—	METAL	—	9/26	9/26	—	—	MILCOR ACCESS DOOR
J-42	3'-0"x7'-0"	1 3/4"	—	A *	WOOD	WOOD	1/27	1/27	—	—	* 16"x16" LOUVER
J-43	3'-0"x7'-0"	1 3/4"	SAFETY	B	H.M.	H.M.	1/26	6/26 11/26	11/26	7/26	
J-44	3'-0"x7'-0"	1 3/4"	SAFETY	B	H.M.	H.M.	1/26	6/26 11/26	11/26	7/26	
J-45 & J-46	3'-0"x3'-0"	1 3/4"	—	A	WOOD	WOOD	1/27	1/27	—	1/27	
BUILDING D-2											
D2-1 THRU D2-6	6'-8"x7'-2"	—	—	*	METAL	—	—	—	—	—	* OVERHEAD DOOR
BUILDING D-3											
D3-1 THRU D3-6	6'-8"x7'-2"	—	—	*	METAL	—	—	—	—	—	* OVERHEAD DOOR



KEY PLAN

REGISTERED ARCHITECT
PAUL P. HALL
STATE OF WASHINGTON

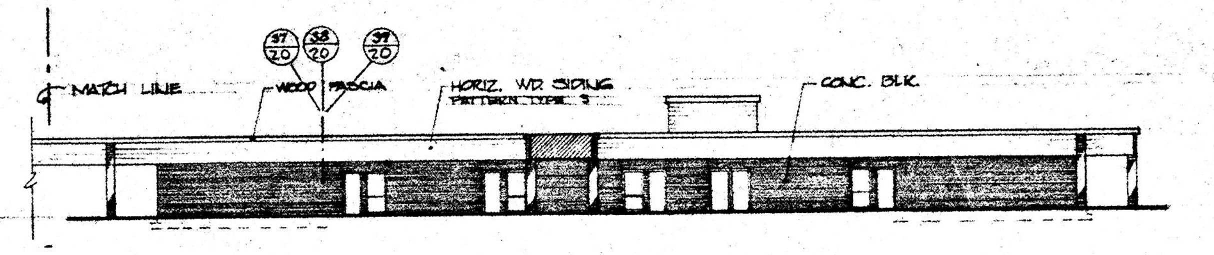
MISC. ITEMS OF WORK
PILCHUCK HIGH SCHOOL
VICINITY ZIEBEL ROAD & SHOULTES ROAD
MARYSVILLE SCHOOL DISTRICT 25
SNOHOMISH COUNTY, WASHINGTON

BLDGS "J", D-2, D3
FLOOR PLANS

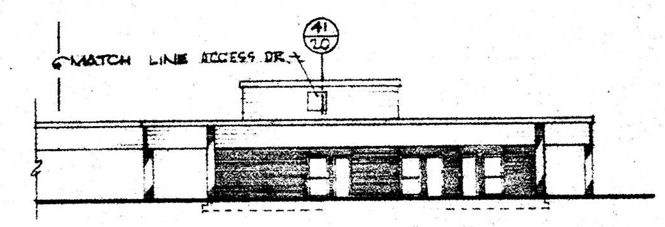
2-3-69
3-11-69
4-11-69
4-6-70
4-9-70

MALLIS, DeHART, LANDS & HALL
ARCHITECTS
831 LYON BUILDING SEATTLE, WASHINGTON 98104

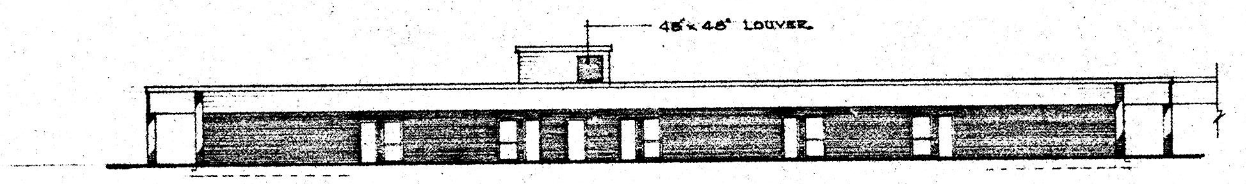
A 10



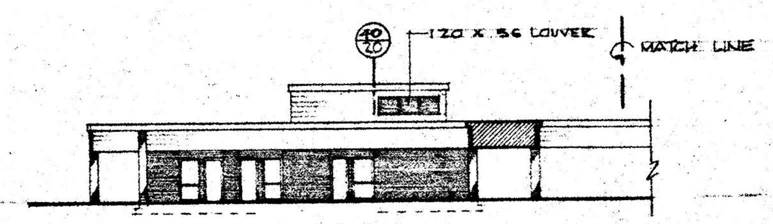
WEST ELEVATION



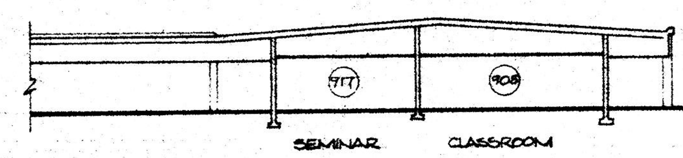
SOUTH ELEVATION



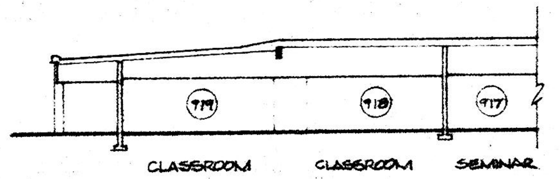
EAST ELEVATION



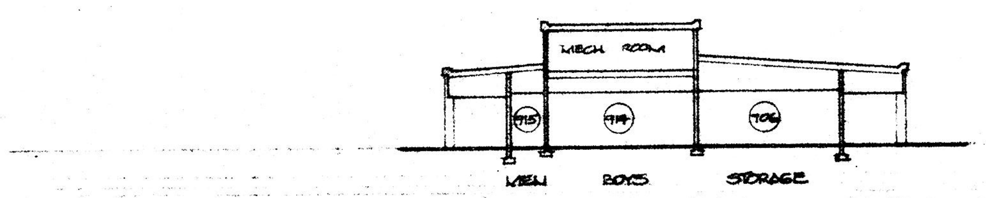
NORTH ELEVATION



SECTION "A-A"



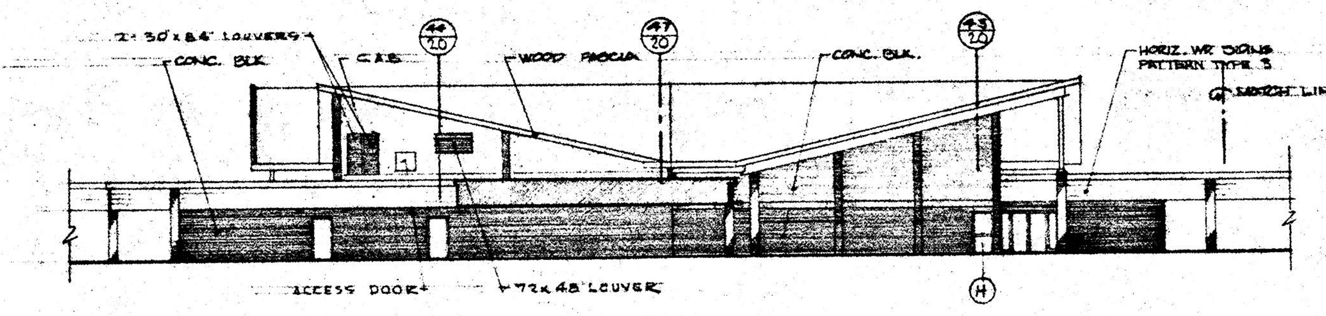
SECTION "B-B"



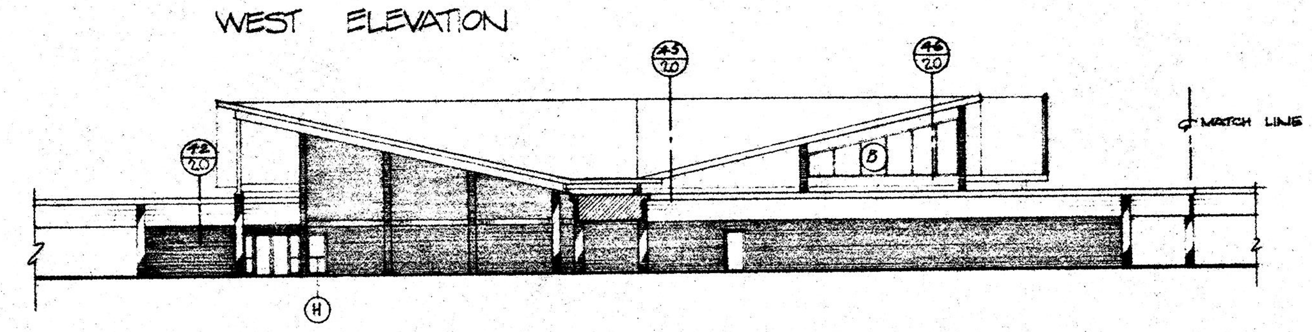
SECTION "C-C"

CLASSROOM BUILDING - UNIT "G"

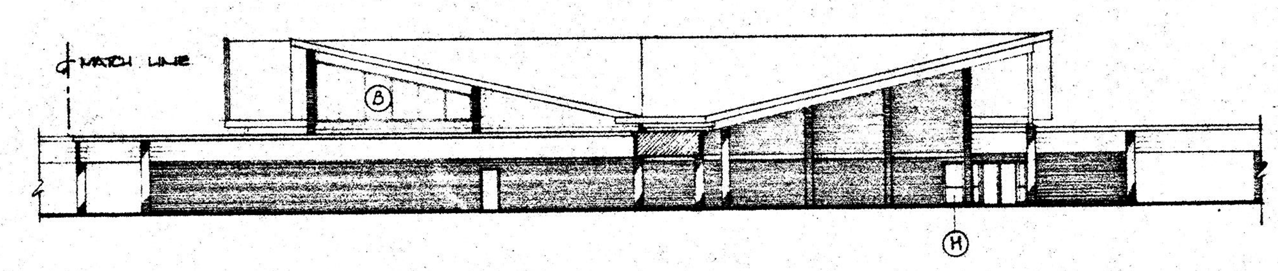
UNIT "H" SIMILAR



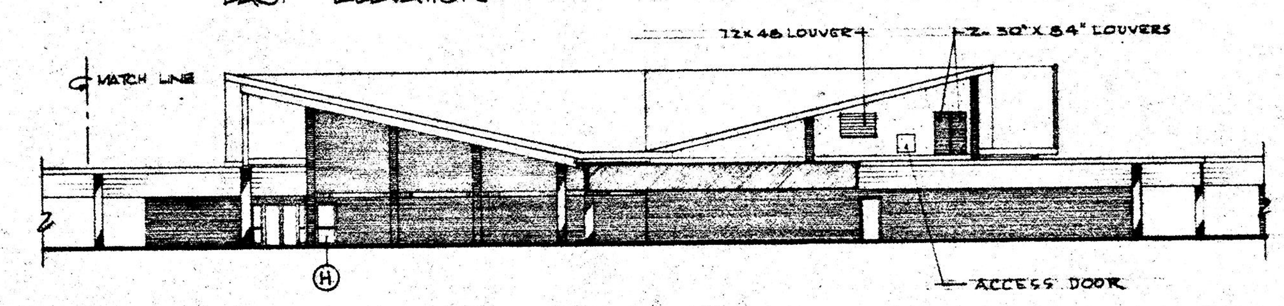
WEST ELEVATION



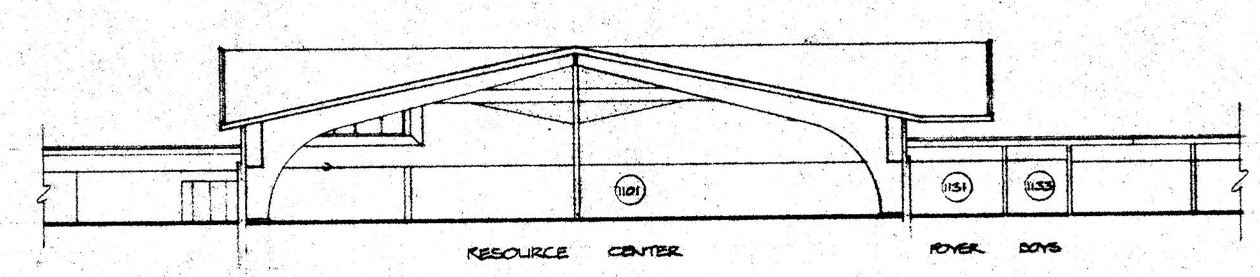
SOUTH ELEVATION



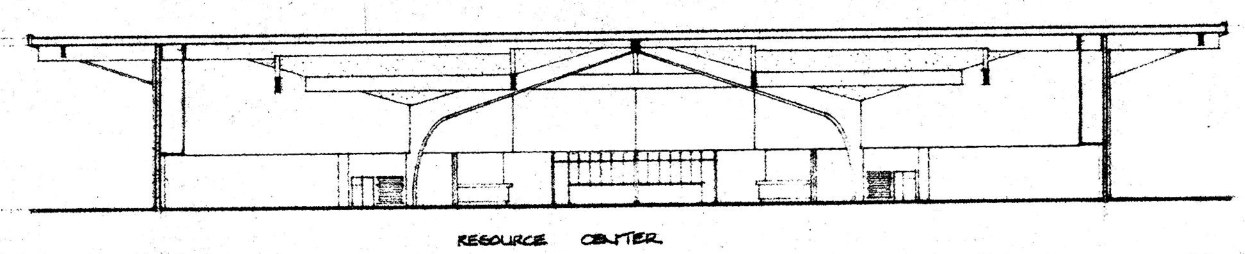
EAST ELEVATION



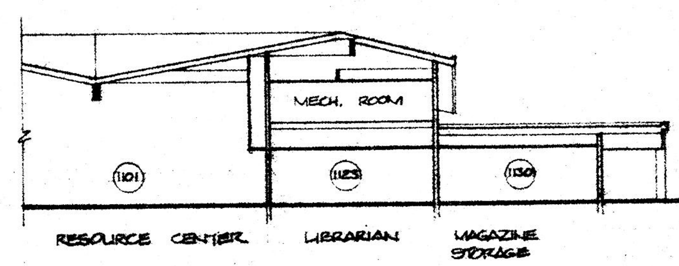
NORTH ELEVATION



SECTION "D-D"

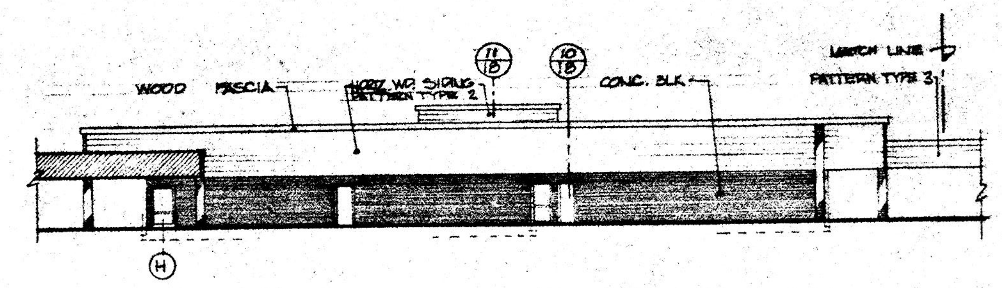


SECTION "E-E"

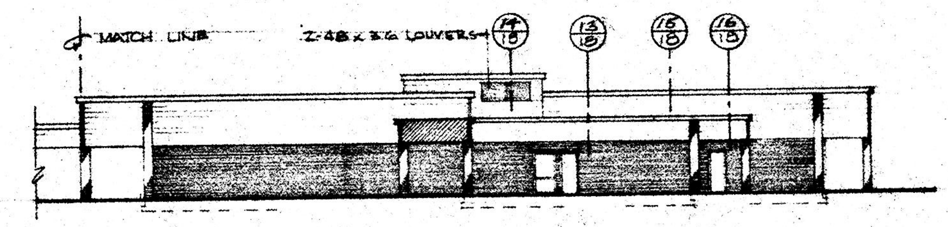


SECTION "F-F"

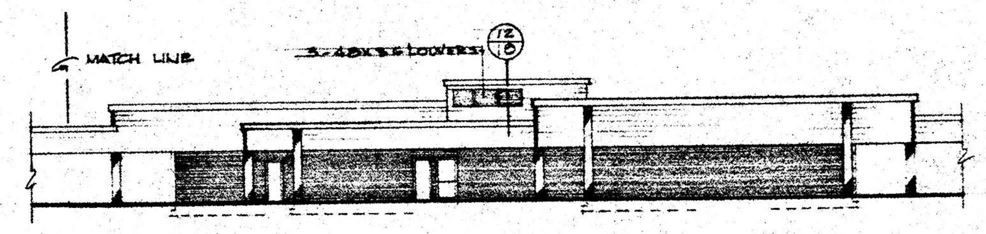
I. M. C. BUILDING - UNIT "J"



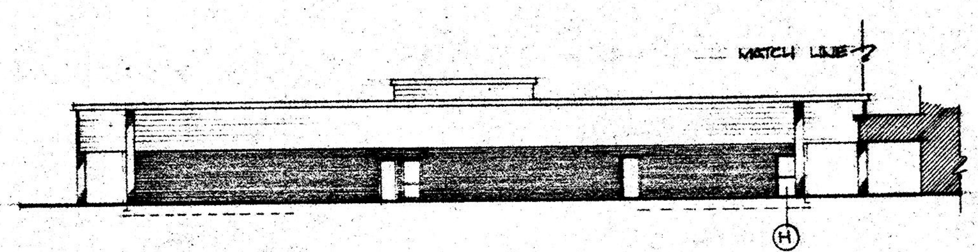
WEST ELEVATION



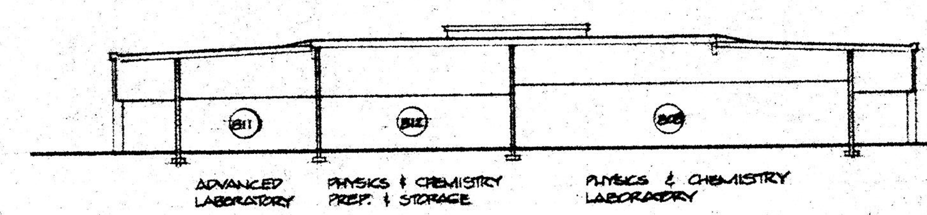
SOUTH ELEVATION



EAST ELEVATION

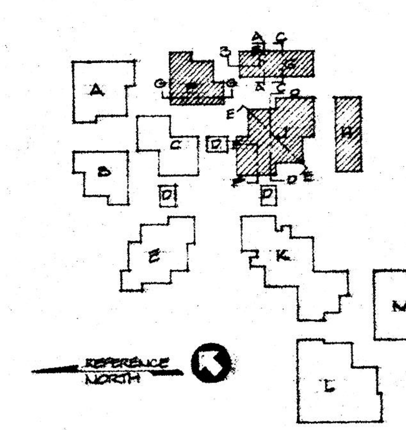


NORTH ELEVATION



SECTION "G-G"

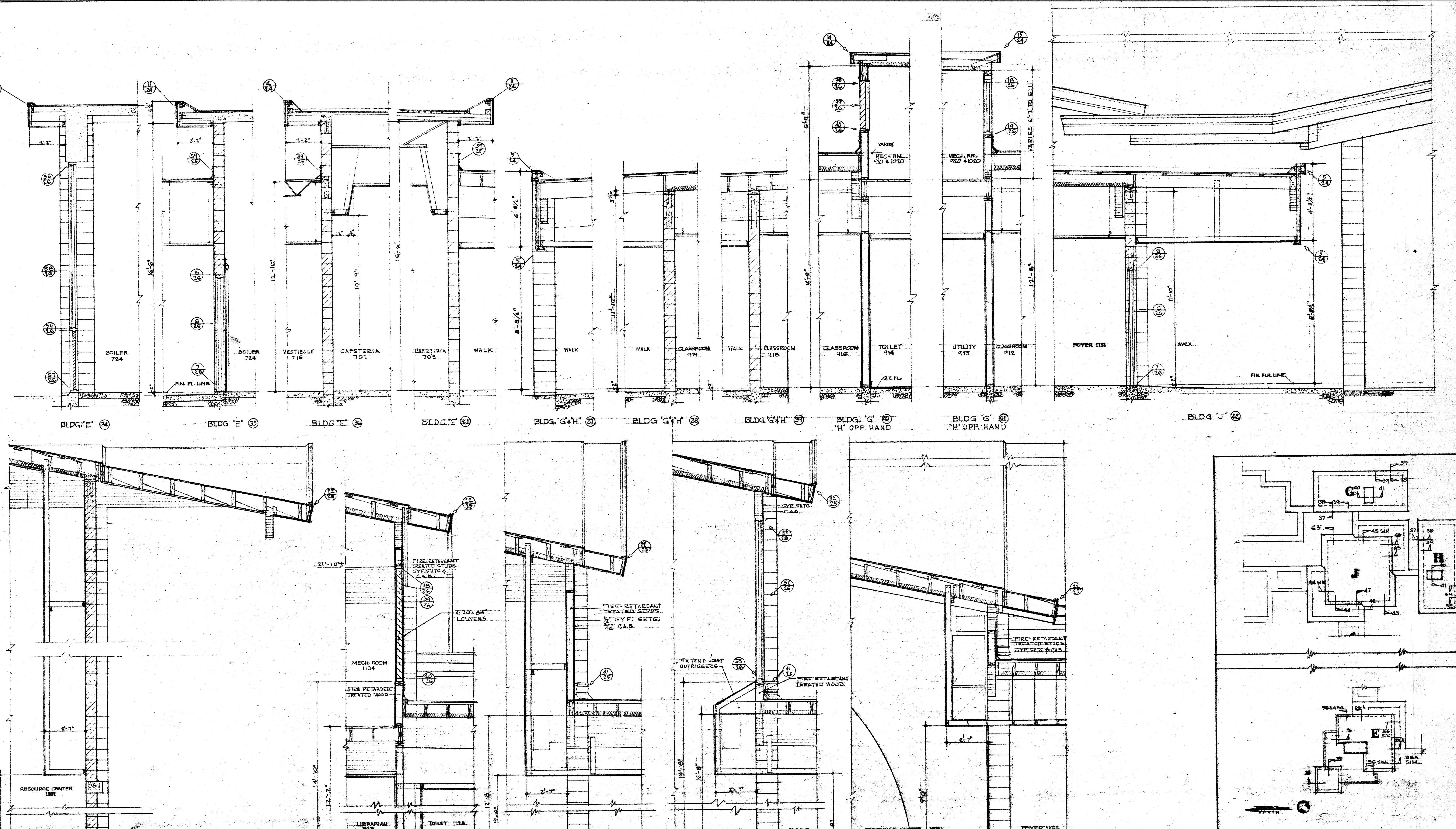
SCIENCE BUILDING - UNIT "F"



KEY PLAN

SCALE: 1/16" = 1'-0"

REGISTERED ARCHITECT, STATE OF WASHINGTON	PILCHUCK HIGH SCHOOL VICINITY ZIEBEL ROAD & SHOULTES ROAD MARYSVILLE SCHOOL DISTRICT 25 SNOHOMISH COUNTY, WASHINGTON	BLDGS F, G, H, & J BLDG ELEVATIONS AND SECTIONS
2-3-69 / 3-11-69 / 4-17-69	MALLIS, DeHART, LANDS & HALL ARCHITECTS 651 LYON BUILDING SEATTLE, WASHINGTON 98104	A 16



PILCHUCK HIGH SCHOOL
VICINITY ZIEBEL ROAD & SHOULTES ROAD
MARYSVILLE SCHOOL DISTRICT 25
SNOHOMISH COUNTY, WASHINGTON

BLDGS E, G, H & J
WALL SECTIONS

REGISTERED ARCHITECT
PAUL P. HALL
STATE OF WASHINGTON

2-3-69
3-11-69
3-24-69
4-17-69

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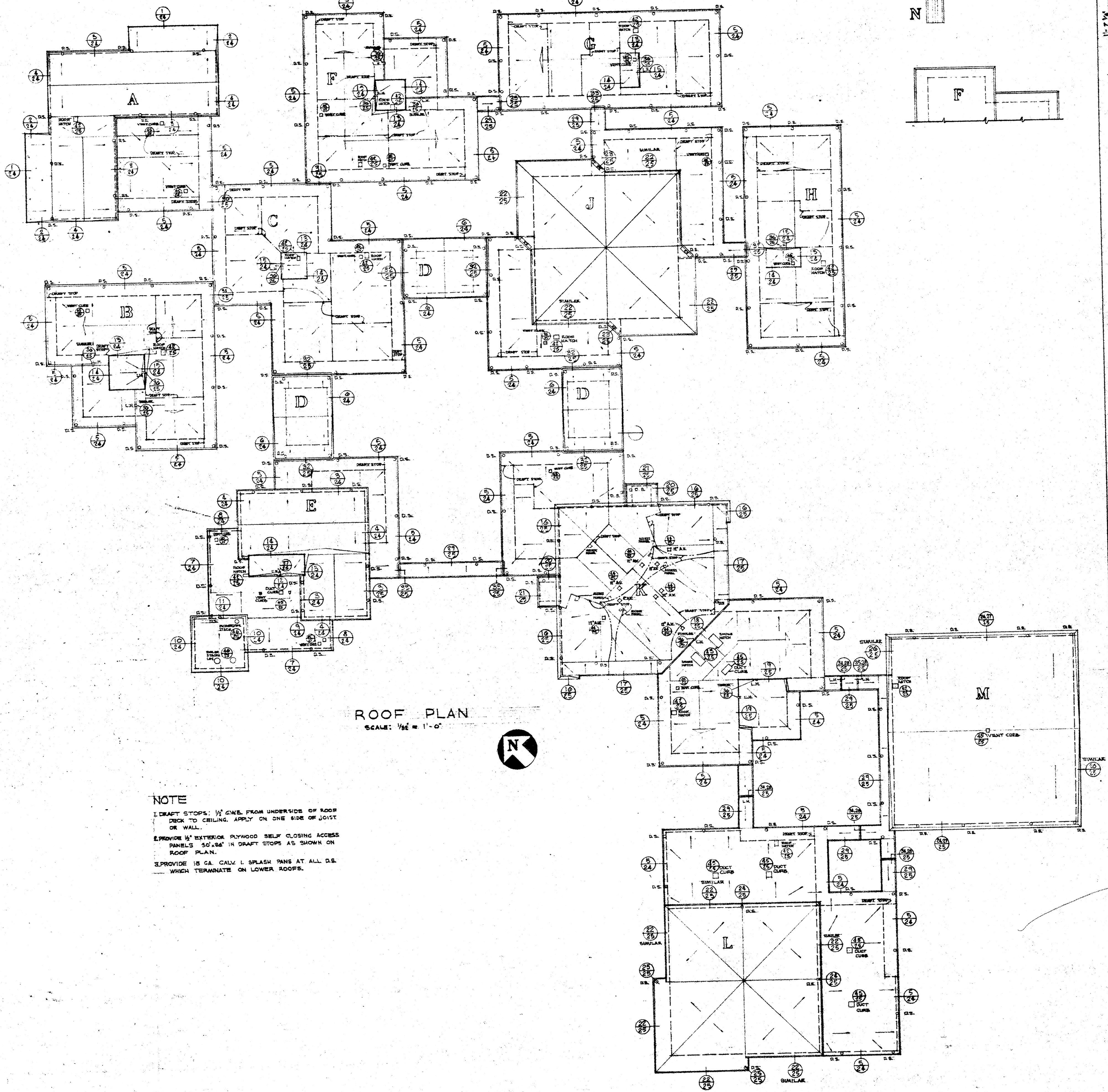
631 LYON BUILDING SEATTLE, WASHINGTON 98104

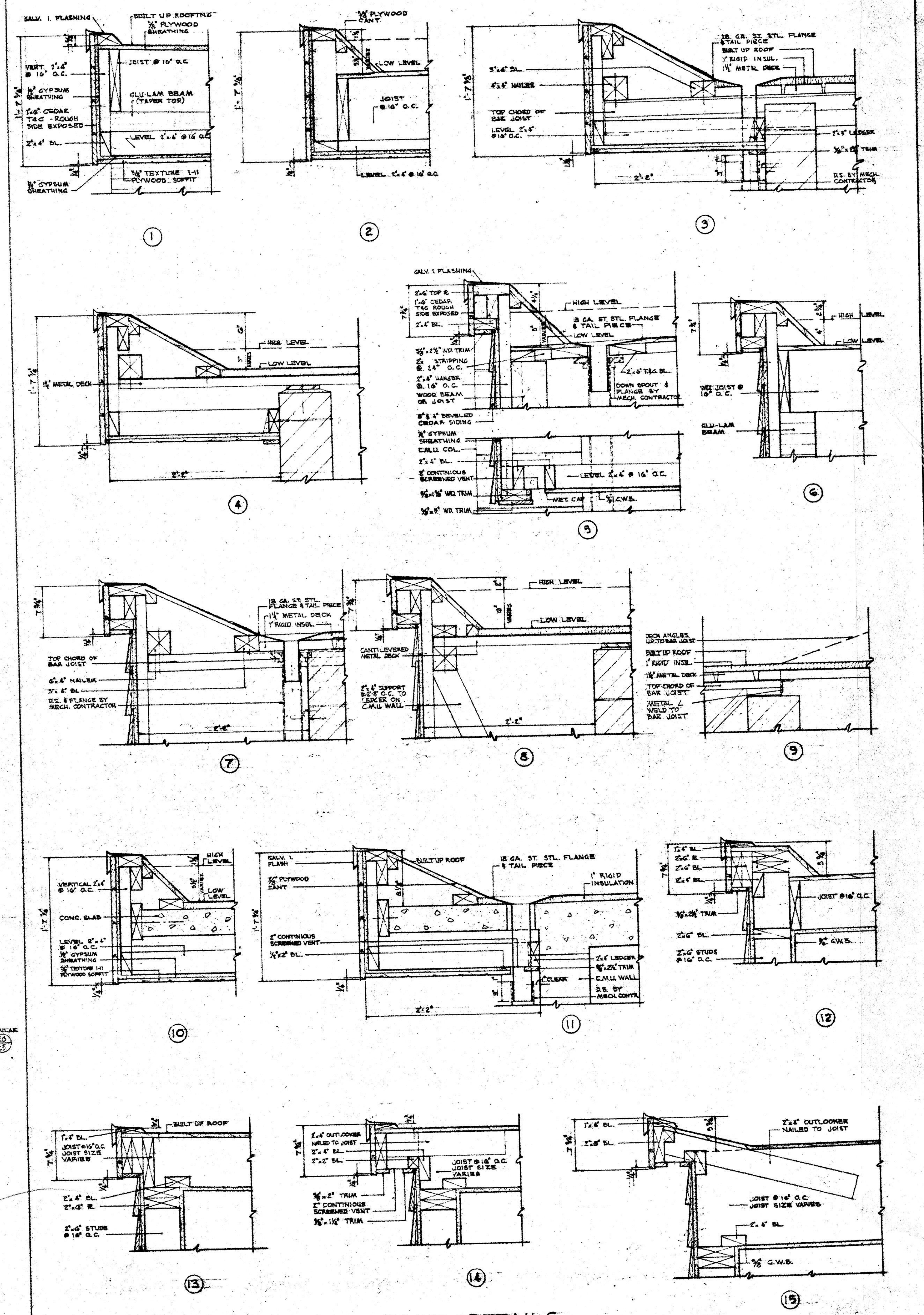
A 20



ROOF PLAN
SCALE: 1/32" = 1'-0"

NOTE

1. DRAFT STOPS: 1/2" G.W.B. FROM UNDERSIDE OF ROOF DECK TO CEILING. APPLY ON ONE SIDE OF JOIST OR WALL.
2. PROVIDE 1/2" EXTERIOR PLYWOOD SELF CLOSING ACCESS PANELS 30"x36" IN DRAFT STOPS AS SHOWN ON ROOF PLAN.
3. PROVIDE 18 GA. GALV. I. SPLASH PANS AT ALL D.S. WHICH TERMINATE ON LOWER ROOFS.



EAVE & RAKE DETAILS
SCALE: 1 1/2" = 1'-0"

REGISTERED ARCHITECT
PAUL P. HALL
STATE OF WASHINGTON

PILCHUCK HIGH SCHOOL
VICINITY ZIEBEL ROAD & SHOULTES ROAD
MARYSVILLE SCHOOL DISTRICT 25
SNOHOMISH COUNTY, WASHINGTON

ROOF PLAN & DETAILS

2-3-69 | 3-11-69 | 3-24-69 | 4-17-69
GH

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ARCHITECTS
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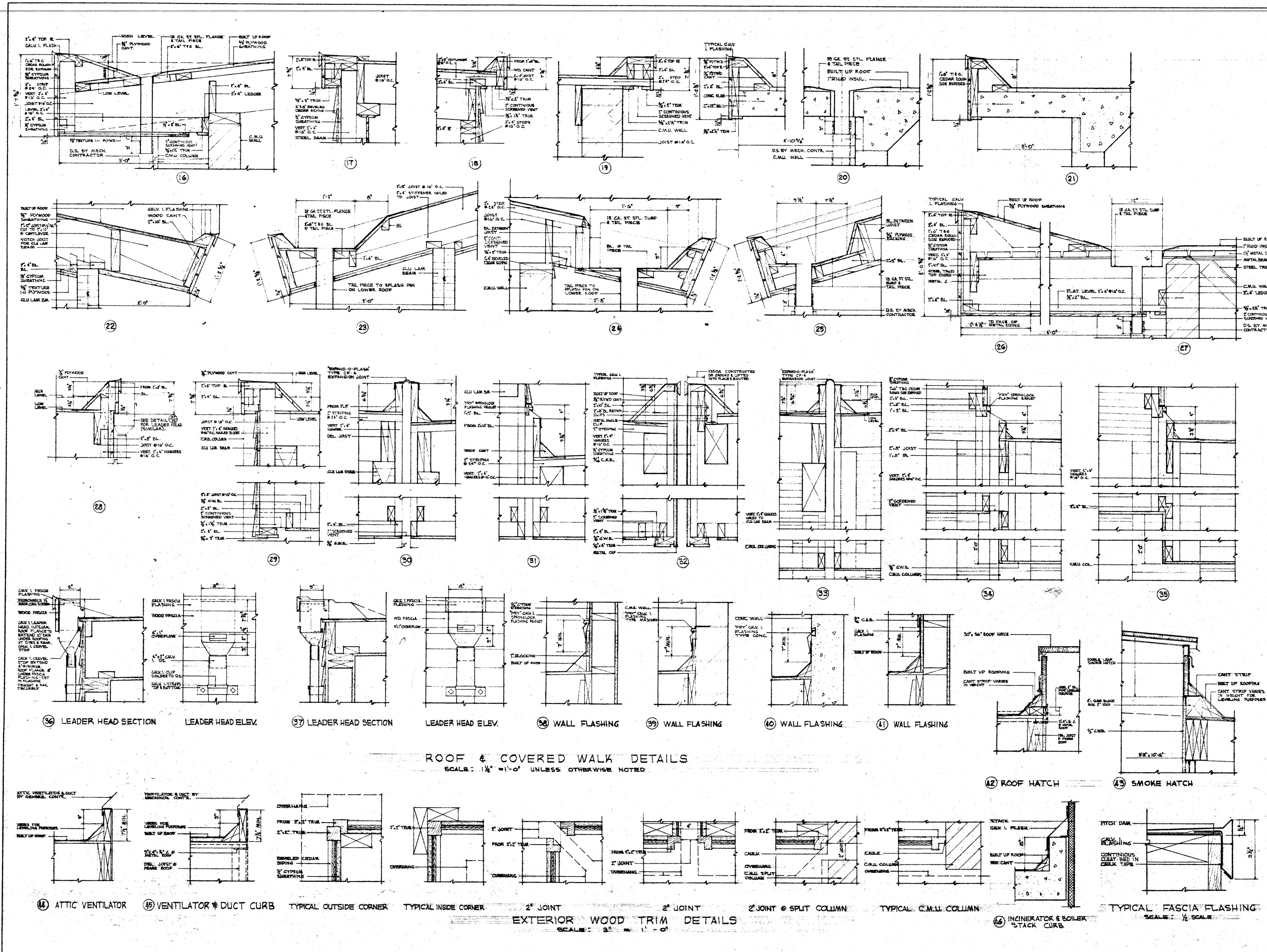
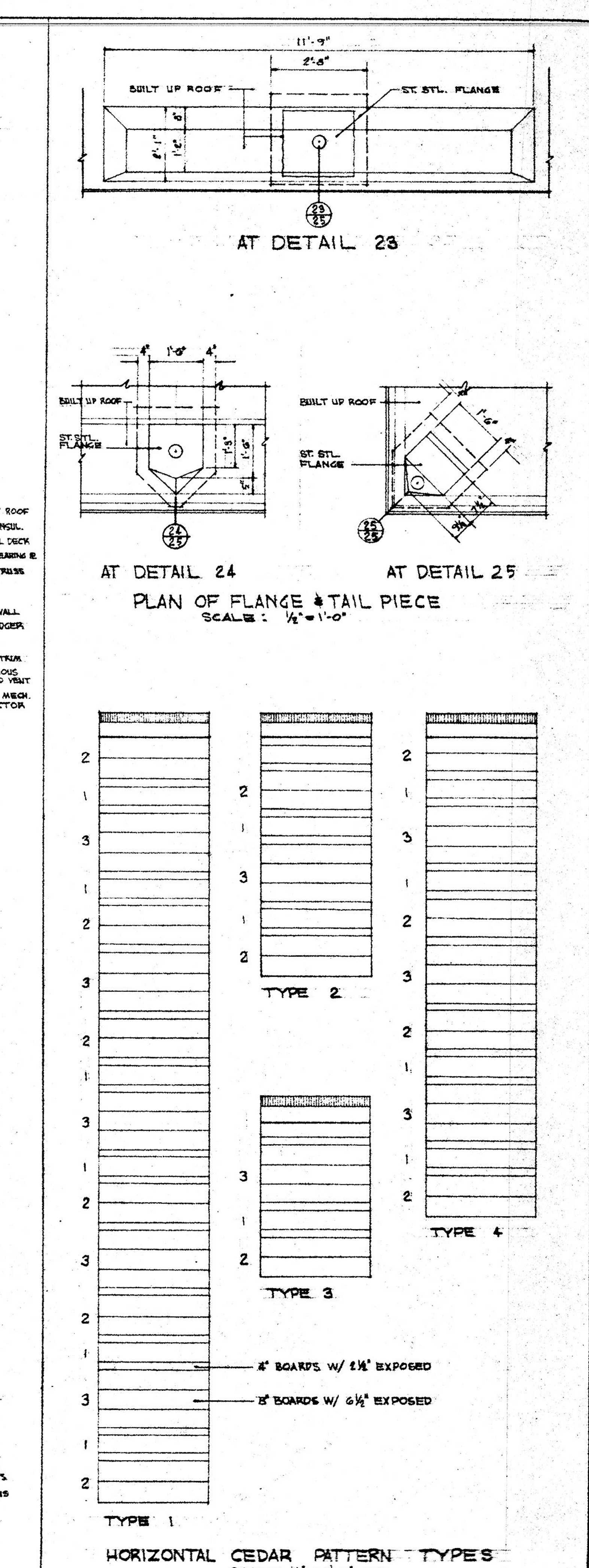
A 24





ROOF DETAILS

PILCHUCK HIGH SCHOOL
VICINITY ZIEBEL ROAD & SHOULTES ROAD
MARYSVILLE SCHOOL DISTRICT 25
SNOHOMISH COUNTY, WASHINGTON

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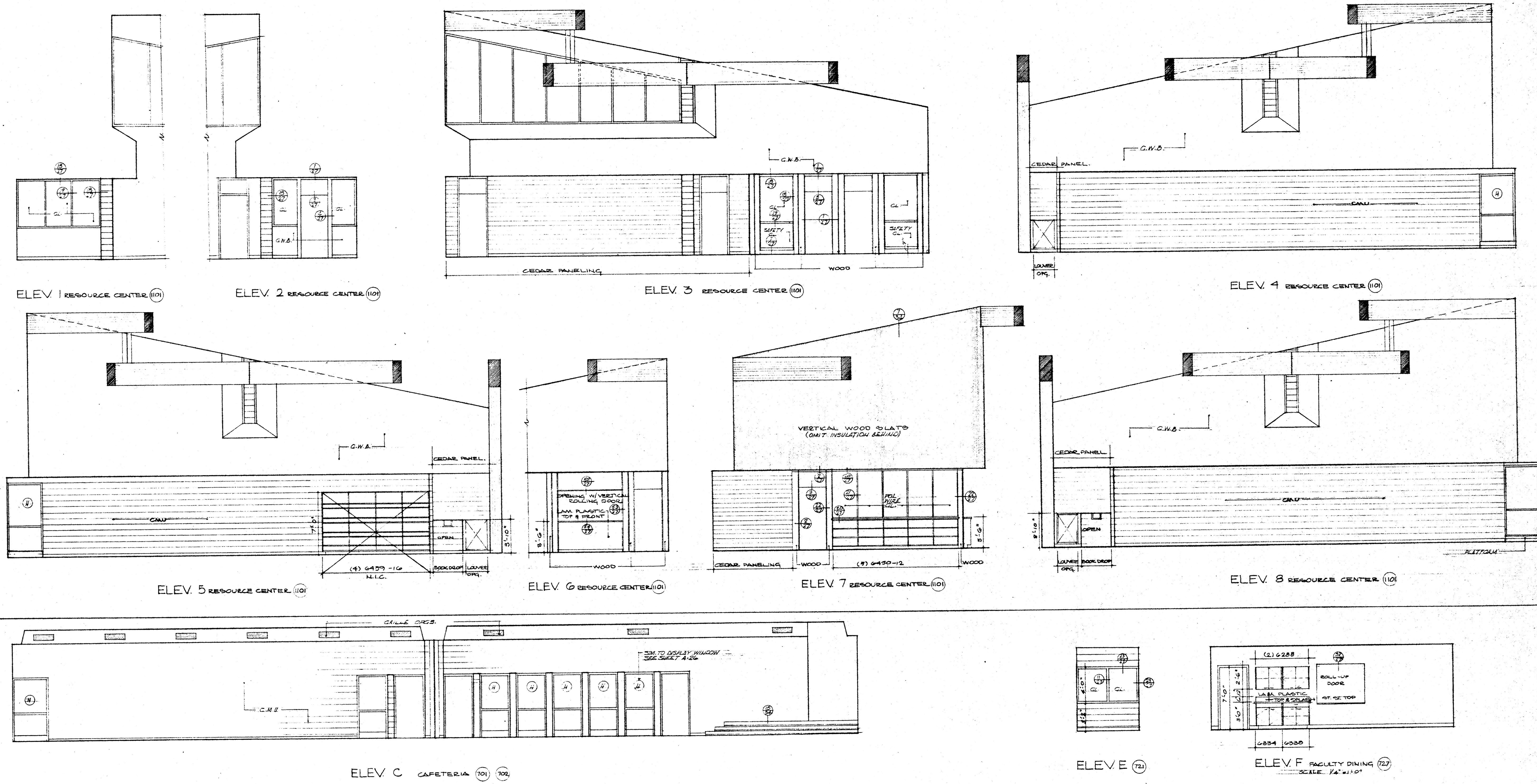
631 LYON BUILDING SEATTLE, WASHINGTON 98104

REGISTERED ARCHITECT
PAUL P. HALL
STATE OF WASHINGTON

3-11-69
3-24-69
6-17-69

A 25



NOTE:
SEE SHEET A-28 FOR GENERAL NOTES.

2002 REGISTERED ARCHITECT PAUL P. HALL STATE OF WASHINGTON

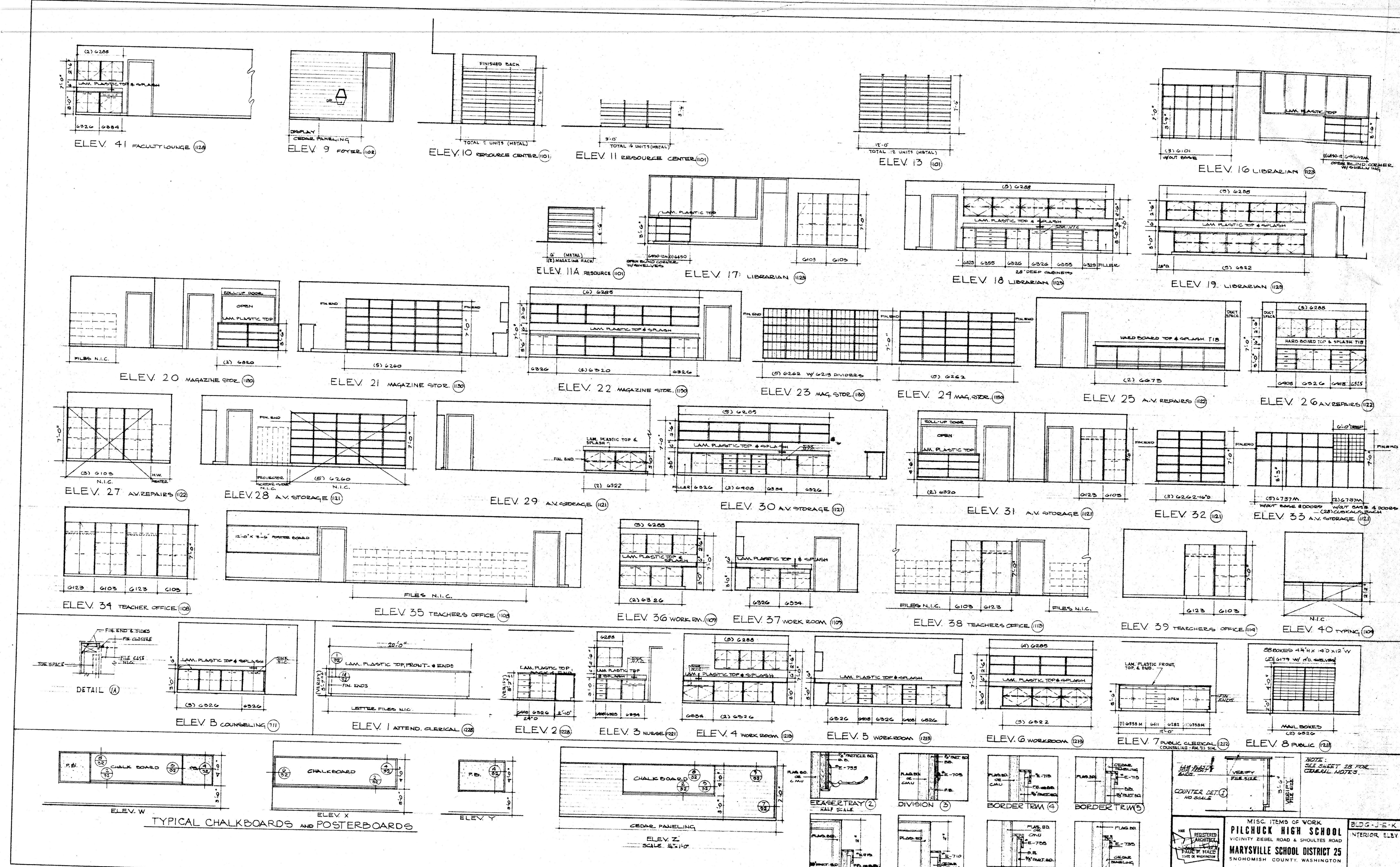
MISC. ITEMS OF WORK
PILCHUCK HIGH SCHOOL
VICINITY ZIEBEL ROAD & SHOULTES ROAD
MARYSVILLE SCHOOL DISTRICT 25
SNOHOMISH COUNTY, WASHINGTON

BLDG "E"
INTERIOR ELEV.

2-3-69 | 3-11-69, 3-24-69, 4-17-69, 4-6-70, 4-9-70
K.O.W.

MALLIS, DeHART, LANDS & HALL
ARCHITECTS
631 LYON BUILDING SEATTLE, WASHINGTON 98104

A 31



NOTE:
SEE SHEET 28 FOR GENERAL NOTES.

REGISTERED ARCHITECT
PAUL P. HALL
STATE OF WASHINGTON

MISC. ITEMS OF WORK
PILCHUCK HIGH SCHOOL
VICINITY ZIEBEL ROAD & SHOULTES ROAD
MARYSVILLE SCHOOL DISTRICT 25
SNOHOMISH COUNTY, WASHINGTON

BLDG - J - E - K
INTERIOR ELEV

2-3-69
K.O.W.
3-11-69
3-24-69
4-17-69
4-6-70
4-9-70

MALLIS, DeHART, LANDS & HALL
ARCHITECTS
631 LYON BUILDING SEATTLE, WASHINGTON 98104

A 32

Appendix F: FEMA E-74 Nonstructural Seismic Bracing Excerpts

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Life Safety Systems

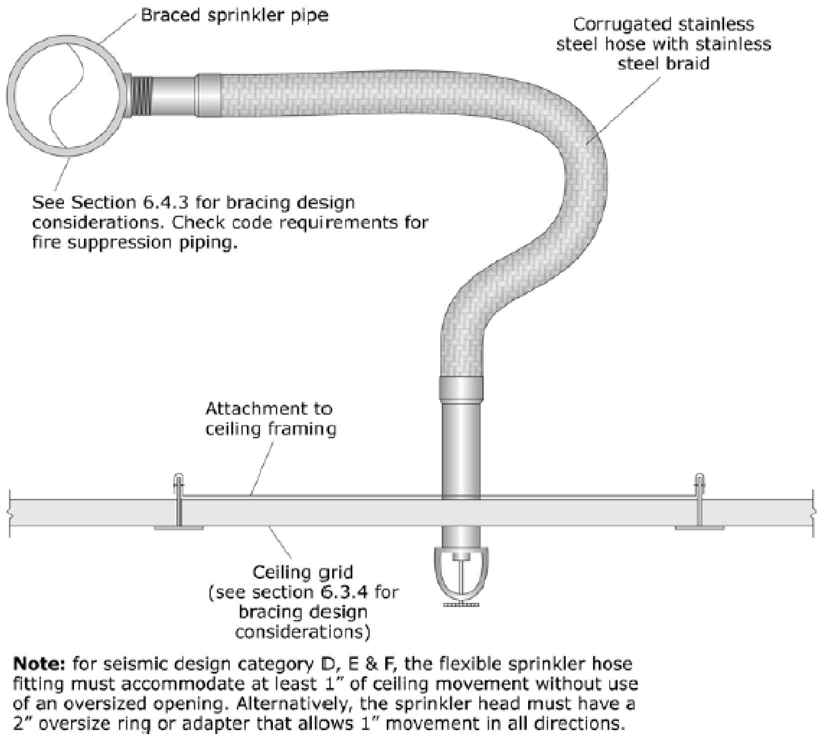


Figure G-1. Flexible Sprinkler Drop.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

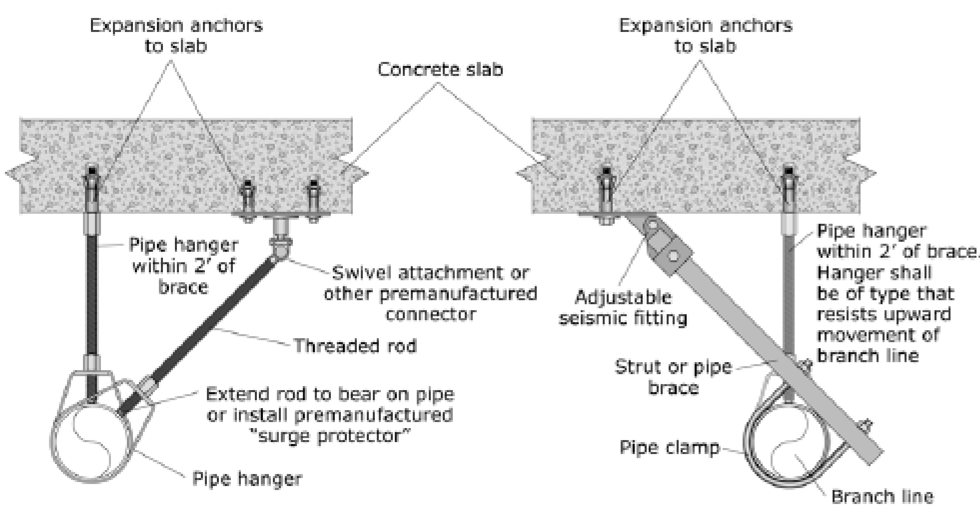


Figure G-2. End of Line Restraint.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

Partitions

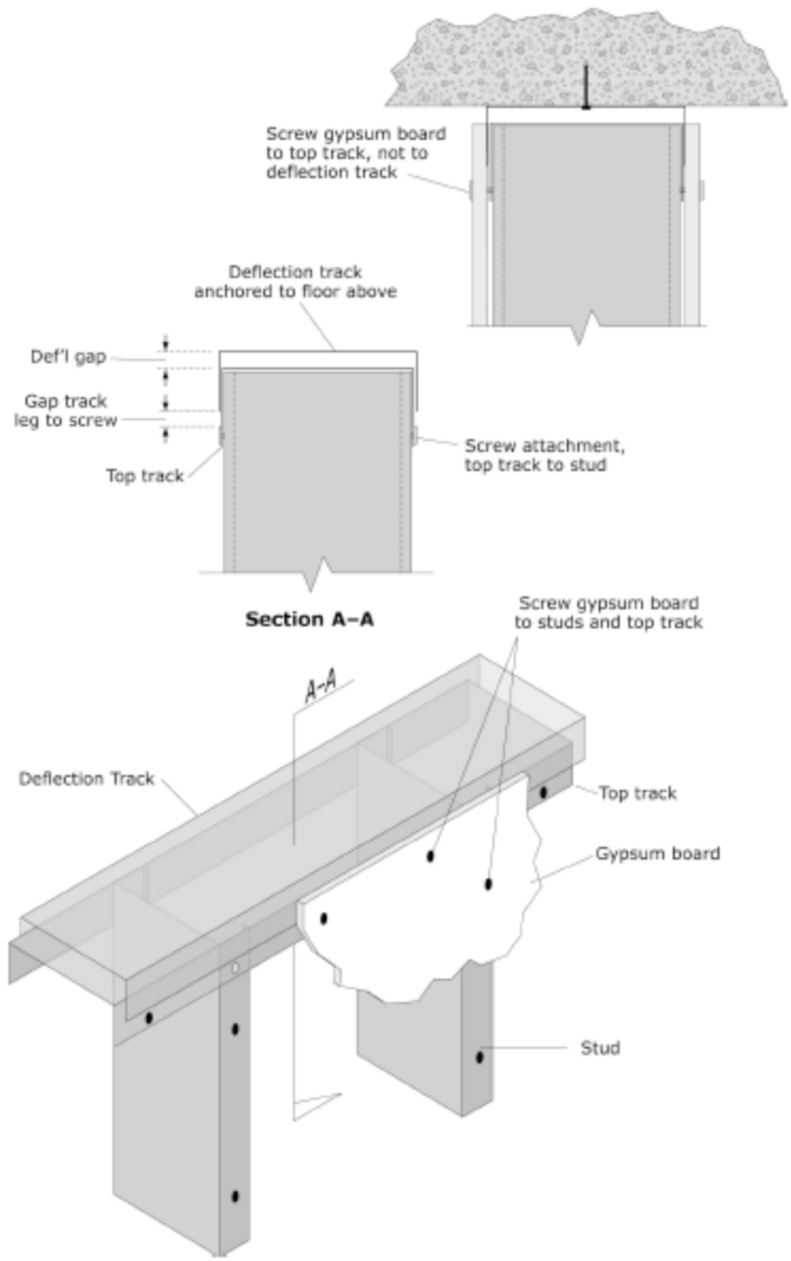


Figure G-3. Mitigation Schemes for Bracing the Tops of Metal Stud Partitions Walls.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

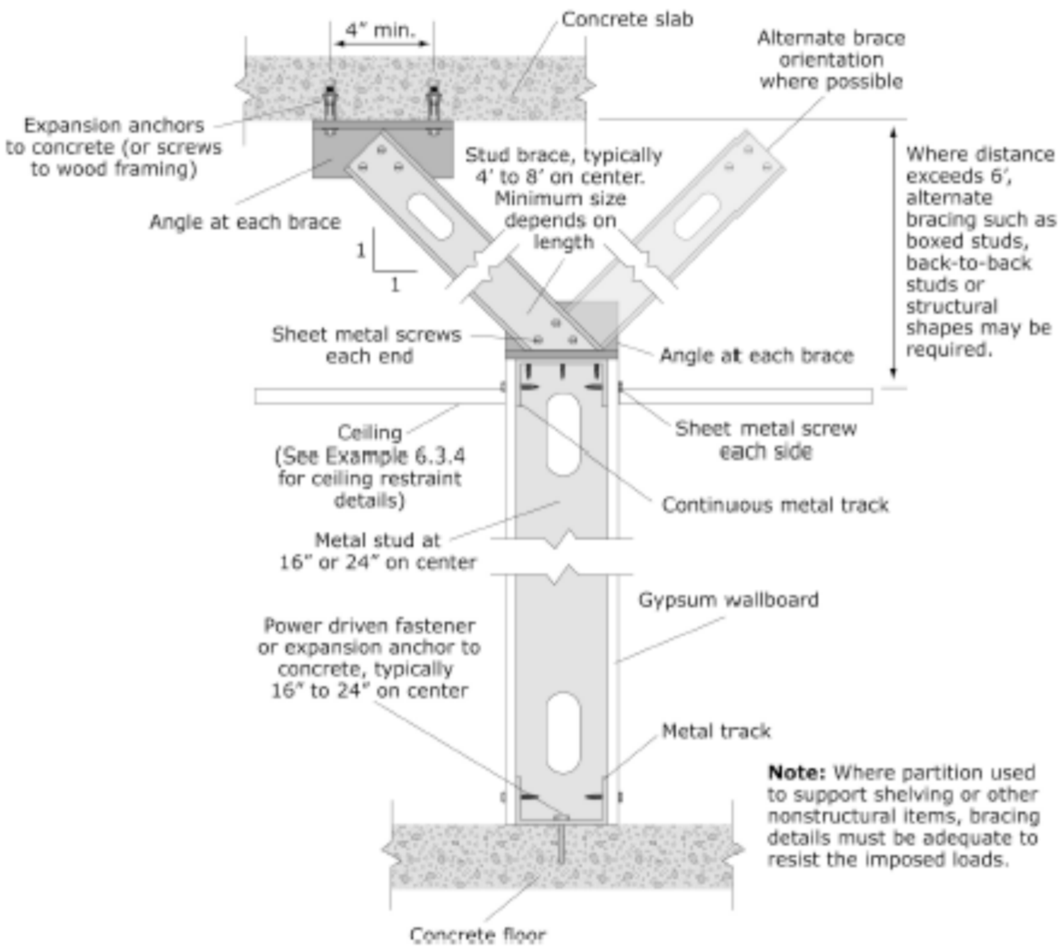
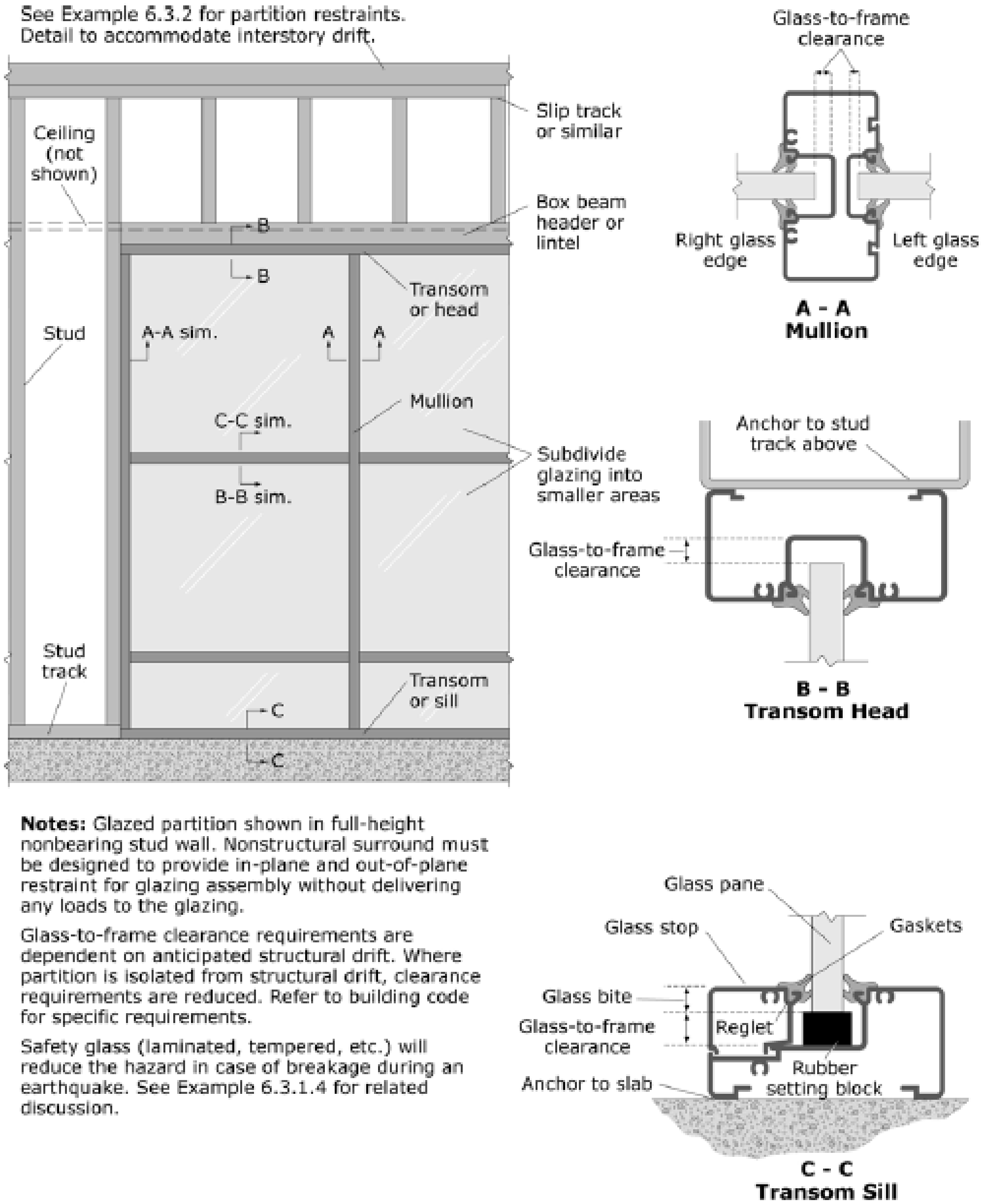


Figure G-4. Mitigation Schemes for Bracing the Tops of Metal Stud Partitions Walls.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)



Notes: Glazed partition shown in full-height nonbearing stud wall. Nonstructural surround must be designed to provide in-plane and out-of-plane restraint for glazing assembly without delivering any loads to the glazing.

Glass-to-frame clearance requirements are dependent on anticipated structural drift. Where partition is isolated from structural drift, clearance requirements are reduced. Refer to building code for specific requirements.

Safety glass (laminated, tempered, etc.) will reduce the hazard in case of breakage during an earthquake. See Example 6.3.1.4 for related discussion.

Figure G-5. Full-height Glazed Partition.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

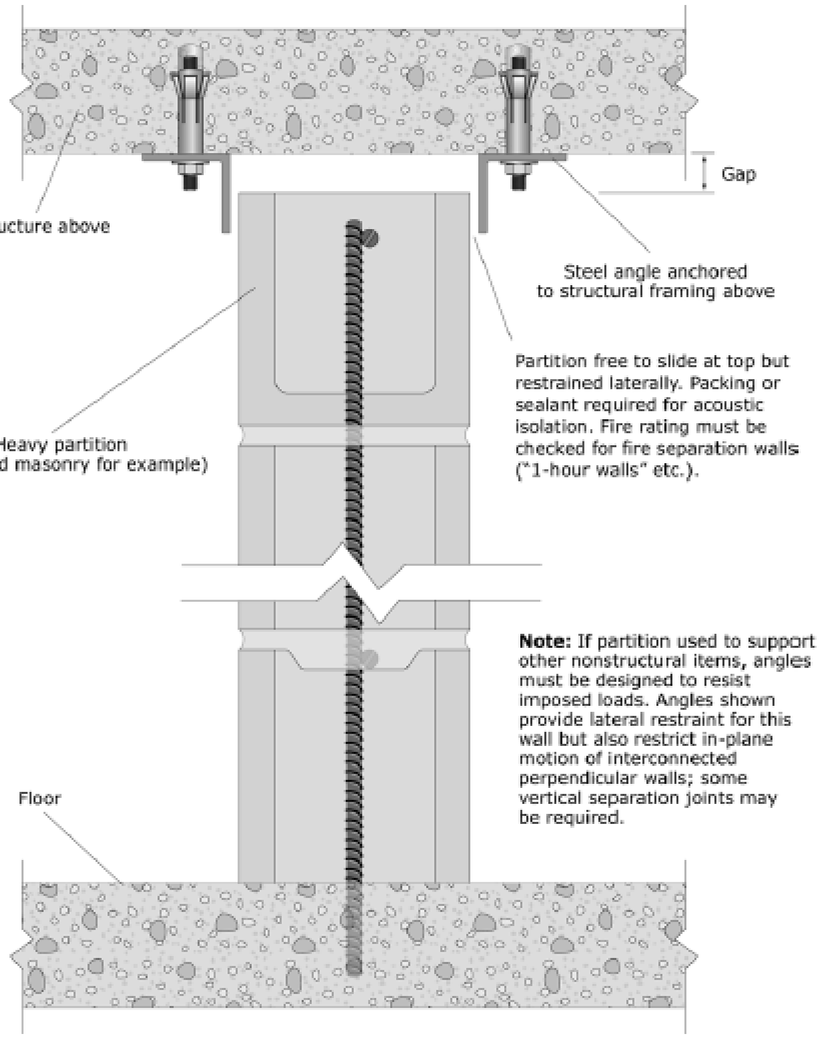


Figure G-6. Full-height Heavy Partition.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

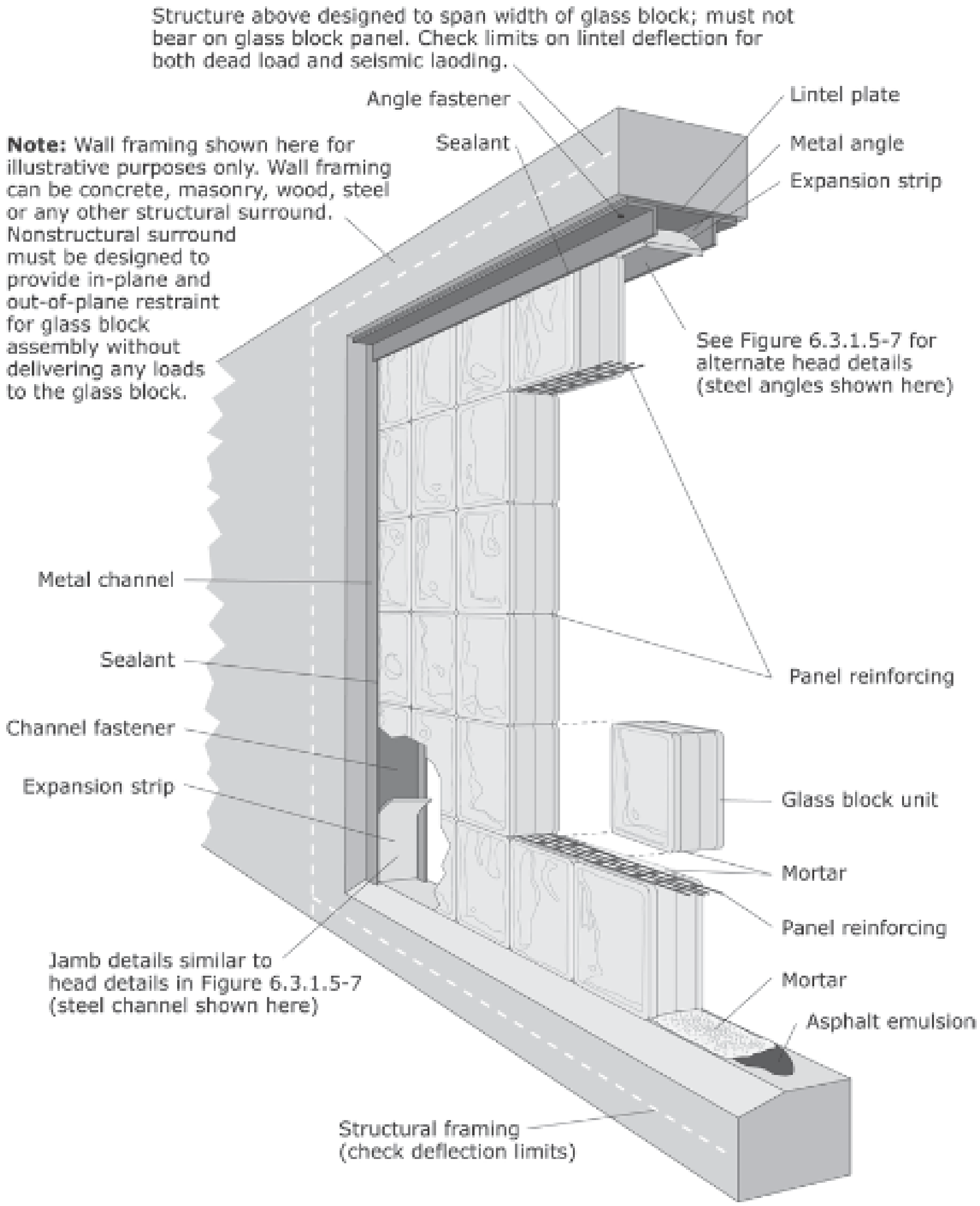


Figure G-7. Typical Glass Block Panel Details.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

Ceilings

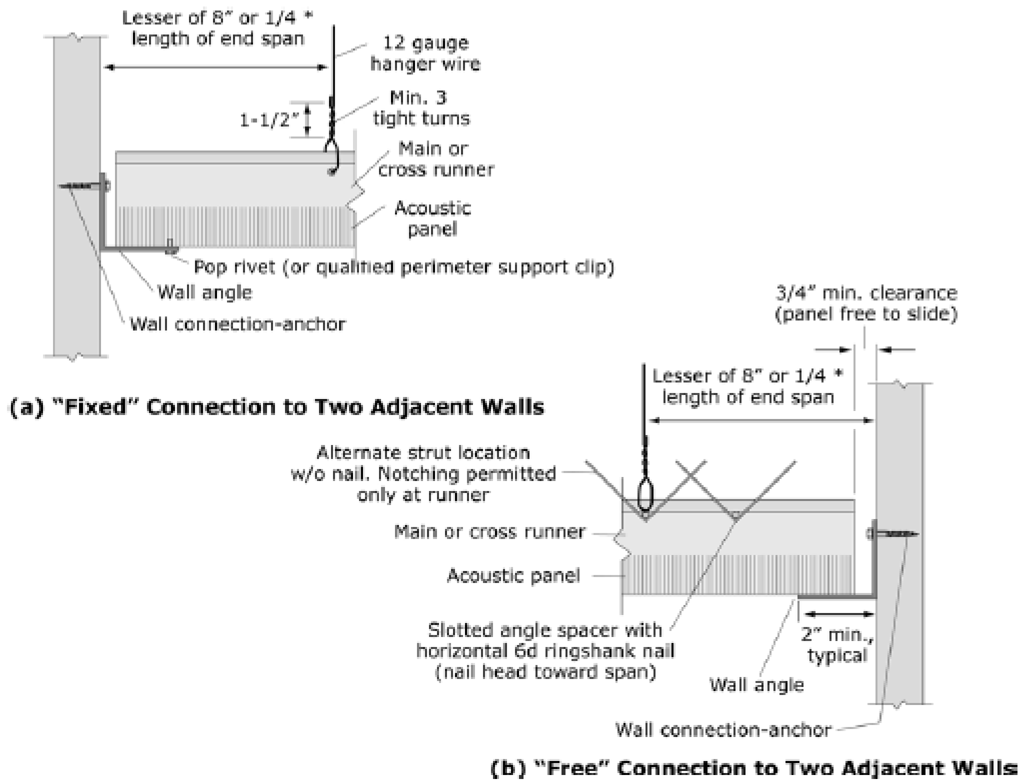
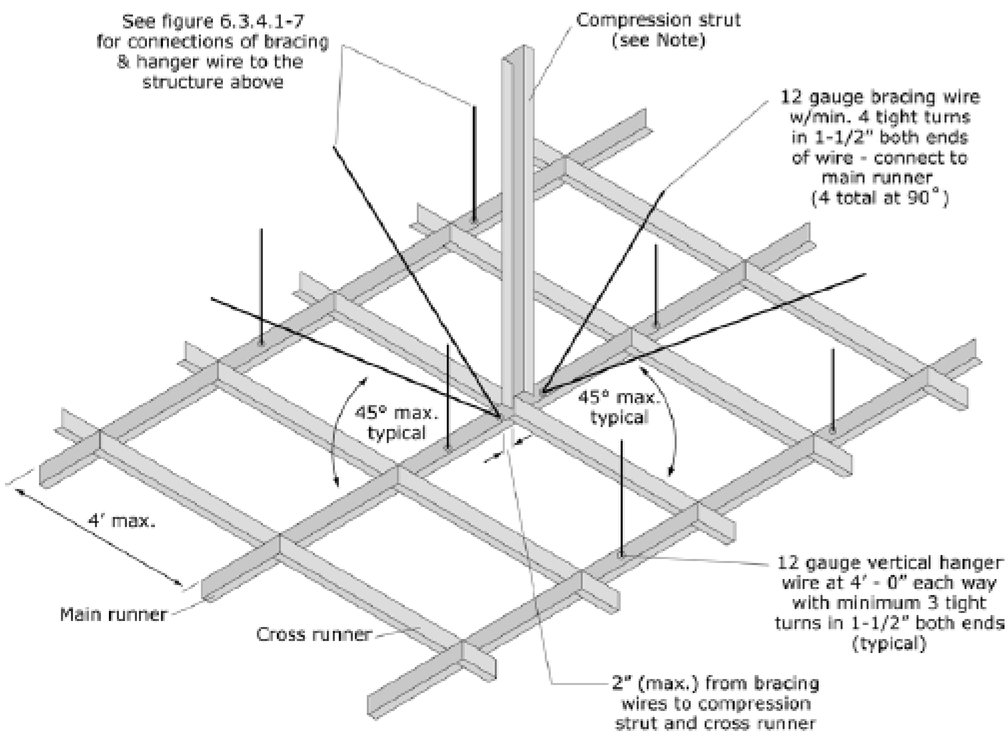


Figure G-8. Suspension System for Acoustic Lay-in Panel Ceilings – Edge Conditions.
(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)



Note: Compression strut shall not replace hanger wire. Compression strut consists of a steel section attached to main runner with 2 - #12 sheet metal screws and to structure with 2 - #12 screws to wood or 1/4" min. expansion anchor to structure. Size of strut is dependent on distance between ceiling and structure (l/r ≤ 200). A 1" diameter conduit can be used for up to 6', a 1-5/8" X 1-1/4" metal stud can be used for up to 10'

Per DSA IR 25-5, ceiling areas less than 144 sq. ft, or fire rated ceilings less than 96 sq. ft., surrounded by walls braced to the structure above do not require lateral bracing assemblies when they are attached to two adjacent walls. (ASTM E580 does not require lateral bracing assemblies for ceilings less than 1000 sq. ft.; see text.)

Figure G-9. Suspension System for Acoustic Lay-in Panel Ceilings – General Bracing Assembly.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

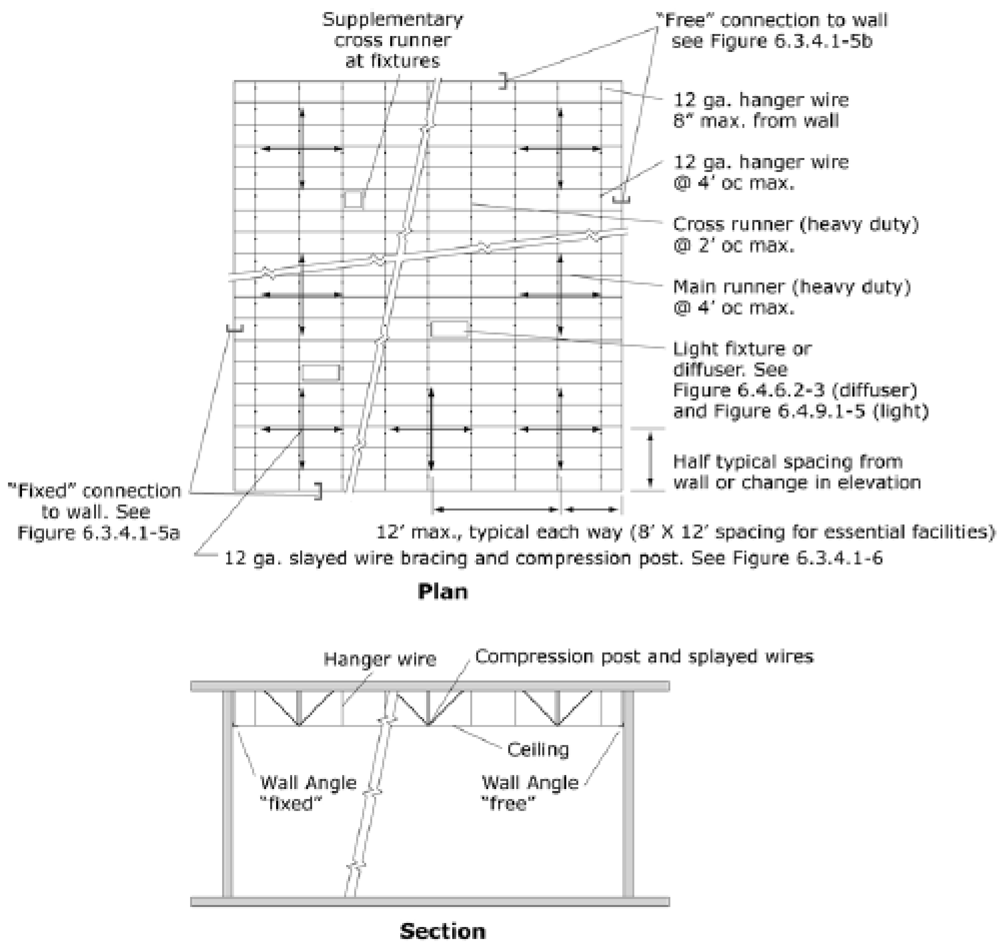


Figure G-10. Suspension System for Acoustic Lay-in Panel Ceilings – General Bracing Layout.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

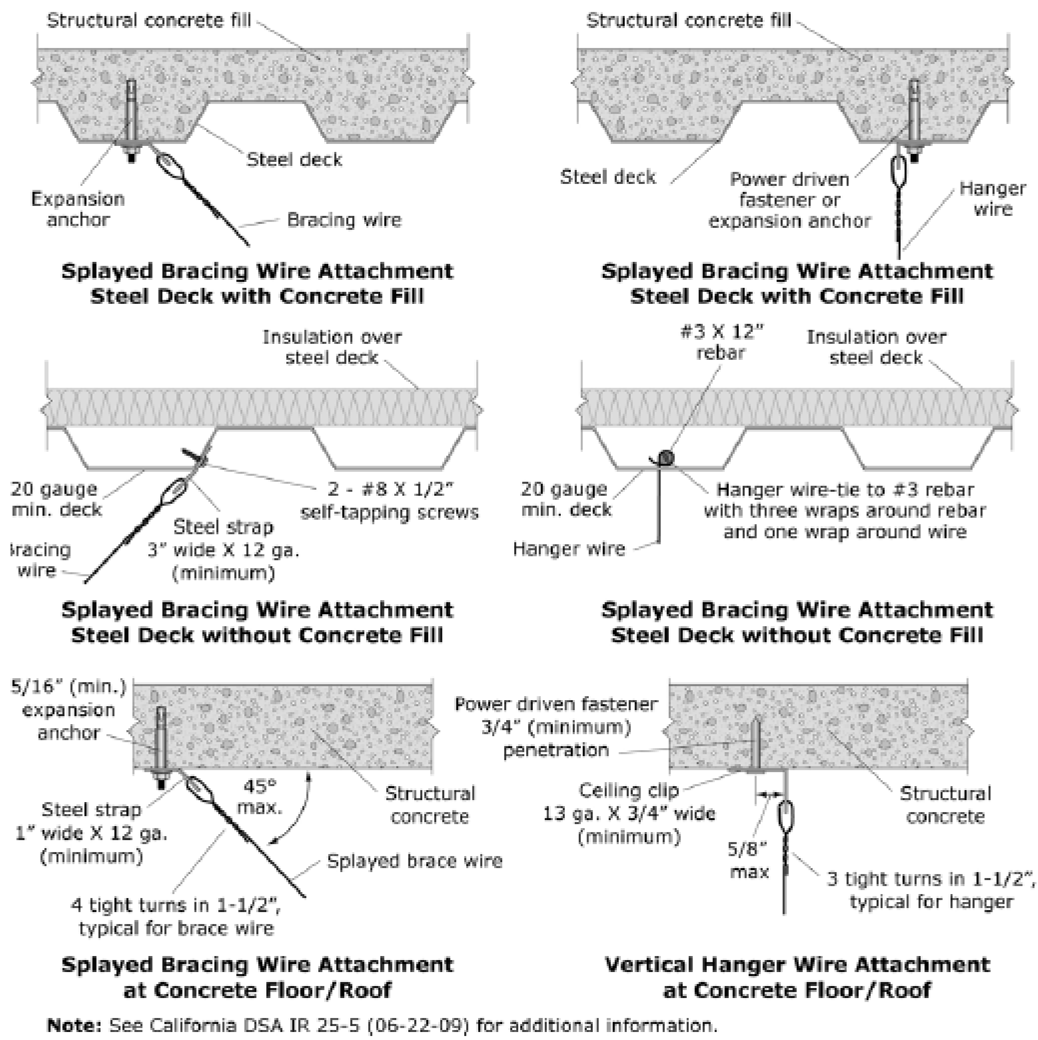
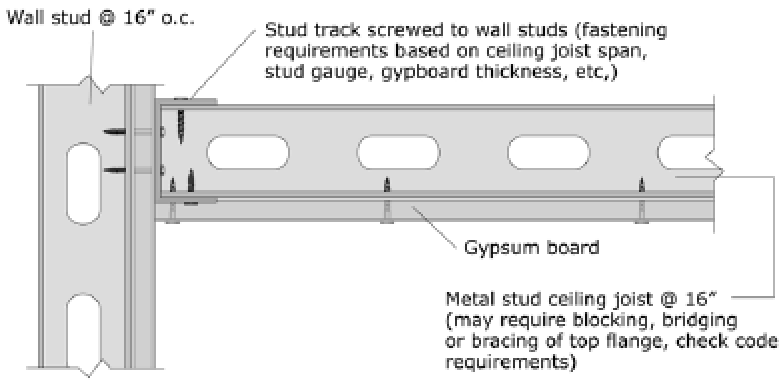
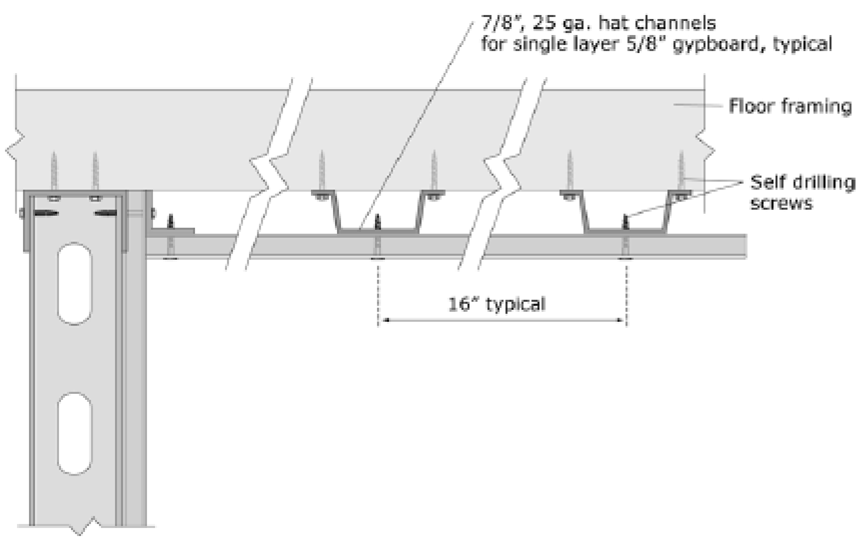


Figure G-11. Suspension System for Acoustic Lay-in Panel Ceilings – Overhead Attachment Details.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)



a) Gypsum board attached directly to ceiling joists



b) Gypsum board attached directly to furring strips (hat channel or similar)

Note: Commonly used details shown; no special seismic details are required as long as furring and gypboard secured. Check for certified assemblies (UL listed, FM approved, etc.) if fire or sound rating required.

Figure G-12. Gypsum Board Ceiling Applied Directly to Structure.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

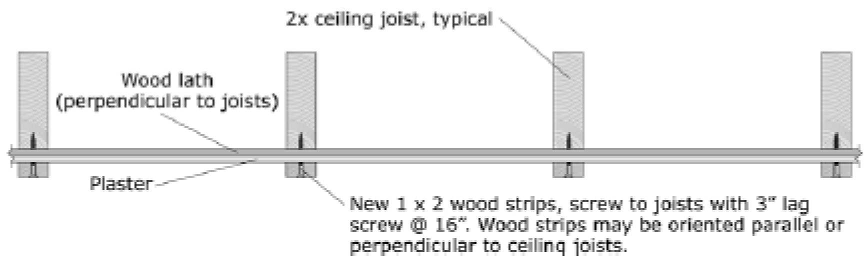


Figure G-13. Retrofit Detail for Existing Lath and Plaster.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

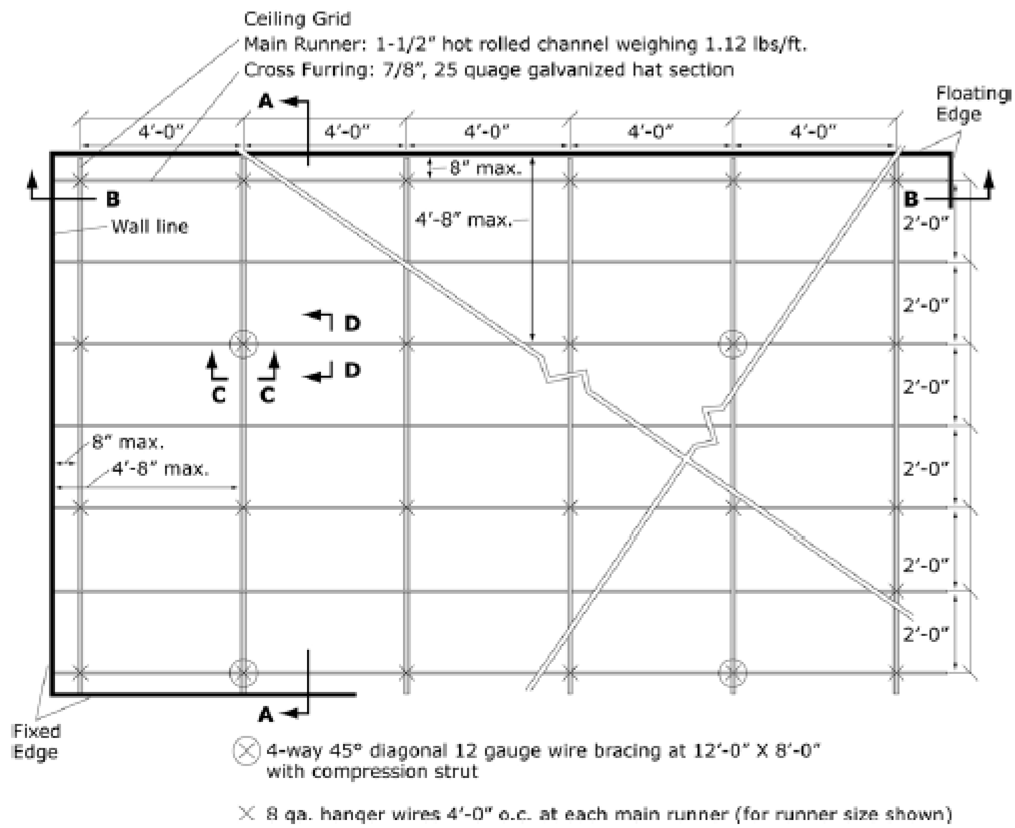


Figure G-14. Diagrammatic View of Suspended Heavy Ceiling Grid and Lateral Bracing.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

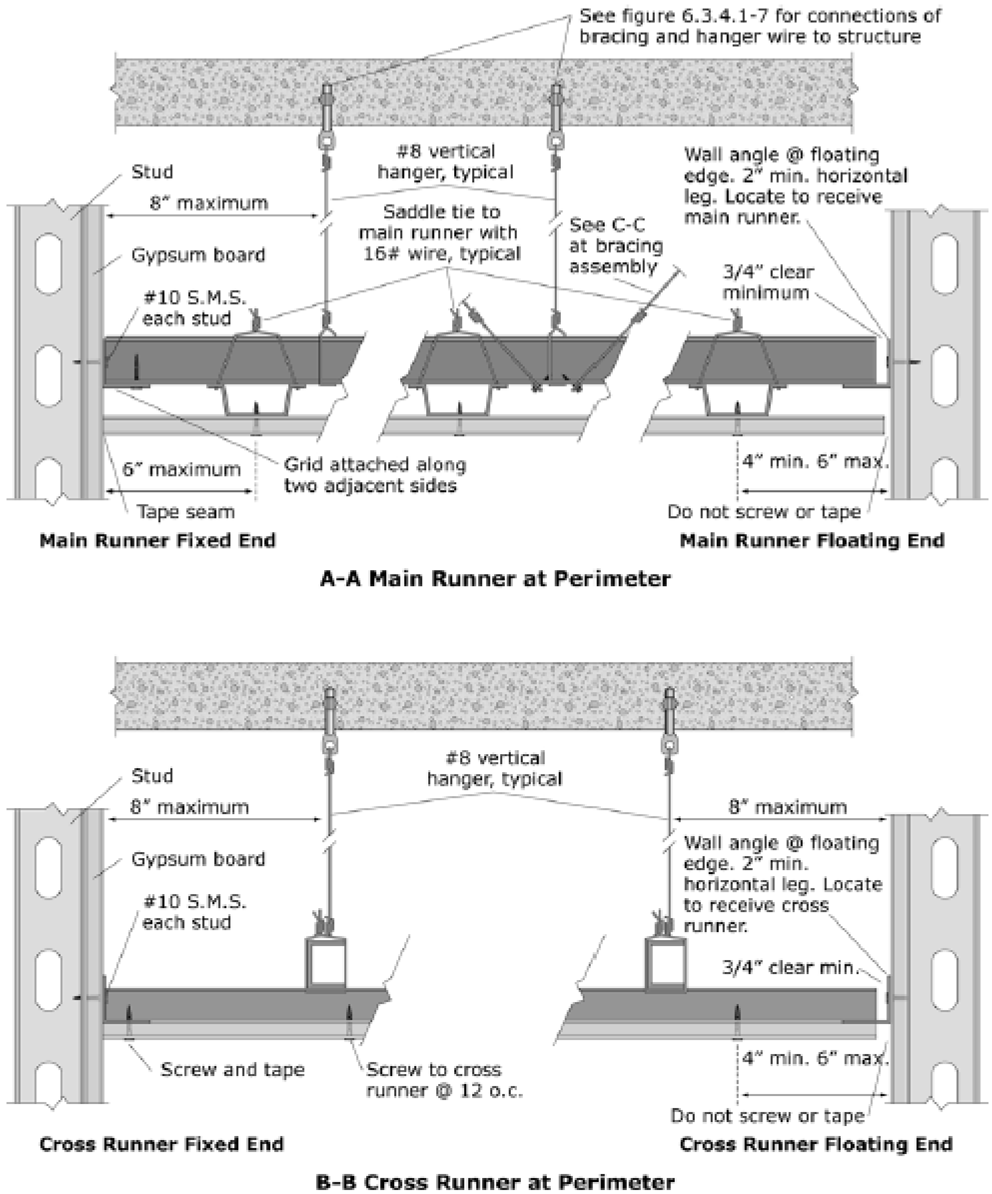
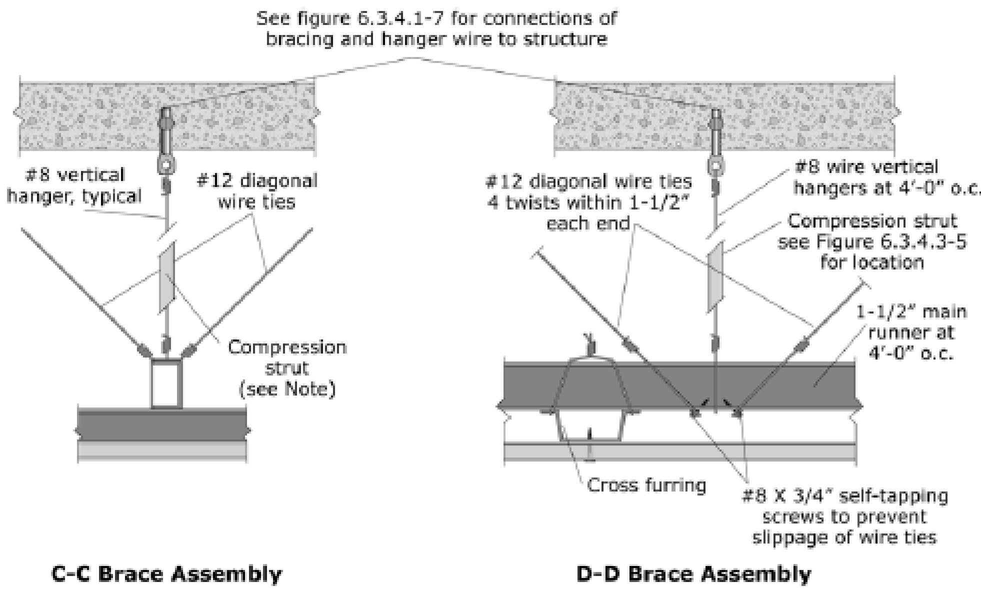


Figure G-15. Perimeter Details for Suspended Gypsum Board Ceiling.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)



Note: Compression strut shall not replace hanger wire. Compresion strut consists of a steel section attached to main runner with 2 - #12 sheet metal screws and to structure with 2 - #12 screws to wood or 1/4″ min. expansion anchor to concrete. Size of strut is dependent on distance between ceiling and structure ($l/r \leq 200$). A 1″ diameter conduit can be used for up to 6′, a 1-5/8″ X 1-1/4″ metal stud can be used for up to 10′. See figure 6.3.4.1-6 for example of bracing assembly.

Figure G-16. Details for Lateral Bracing Assembly for Suspended Gypsum Board Ceiling.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

Light Fixtures

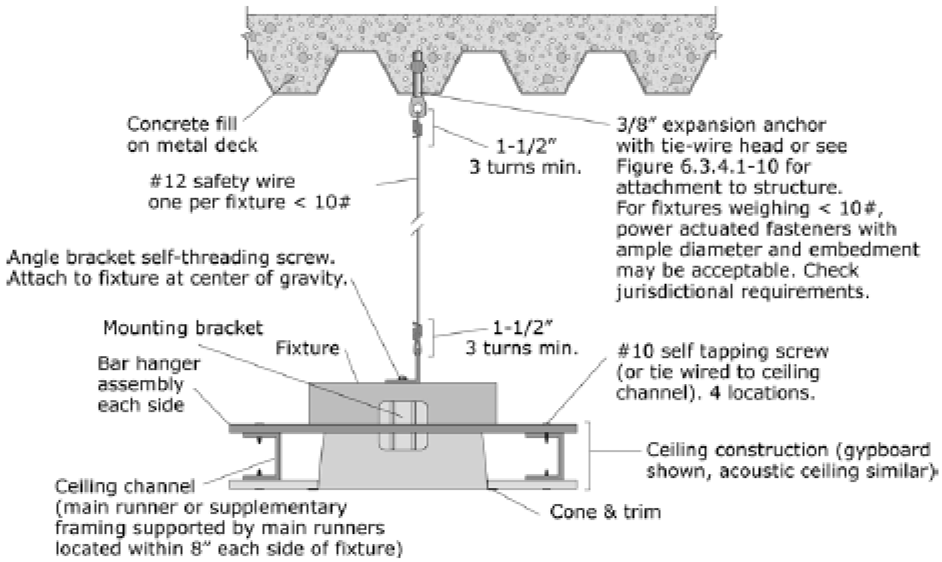


Figure G-17. Recessed Light Fixture in suspended Ceiling (Fixture Weight < 10 pounds).

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

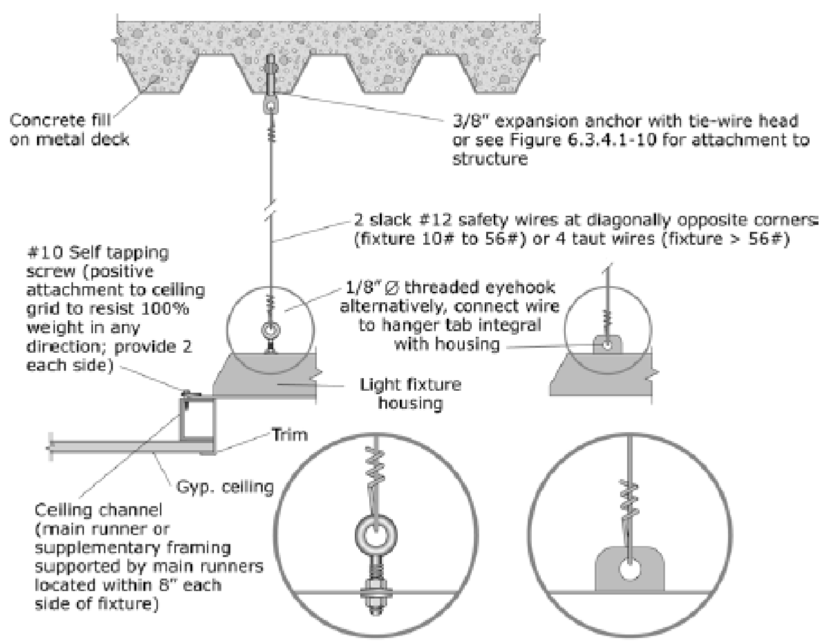


Figure G-18. Recessed Light Fixture in suspended Ceiling (Fixture Weight 10 to 56 pounds).

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

Contents and Furnishings

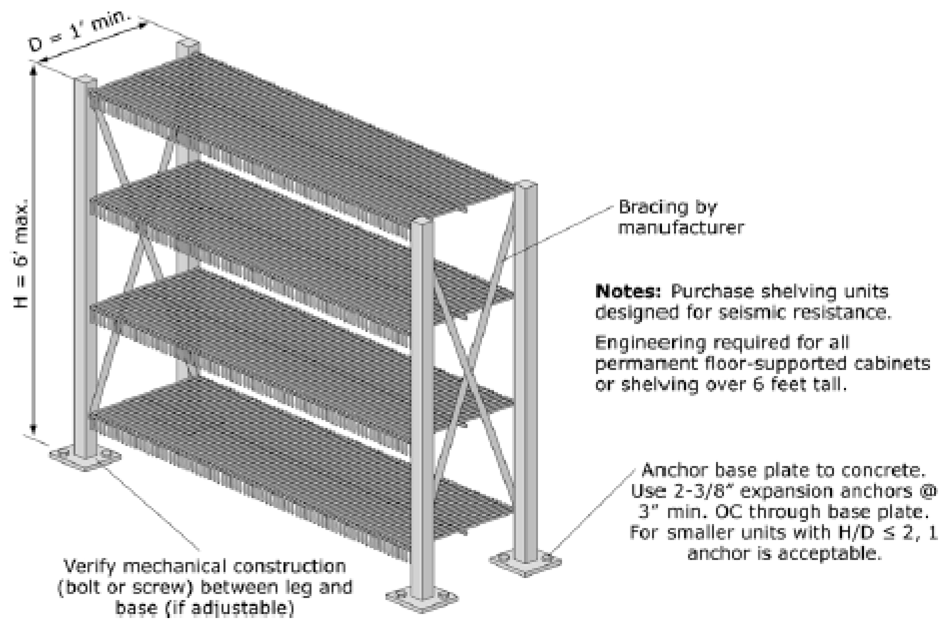
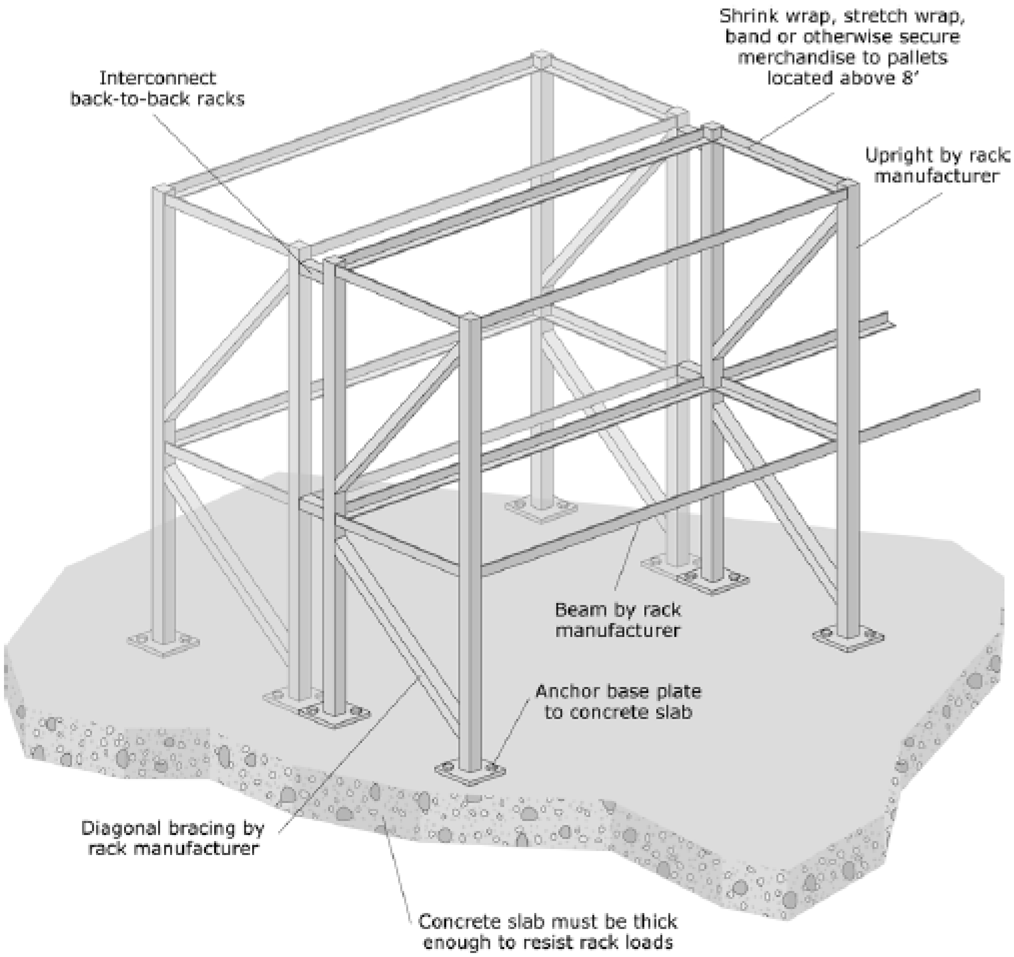


Figure G-19. Light Storage Racks.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)



Note: Purchase storage racks designed for seismic resistance. Storage racks may be classified as either nonstructural elements or nonbuilding structures depending upon their size and support conditions. Check the applicable code to see which provisions apply.

Figure G-20. Industrial Storage Racks.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

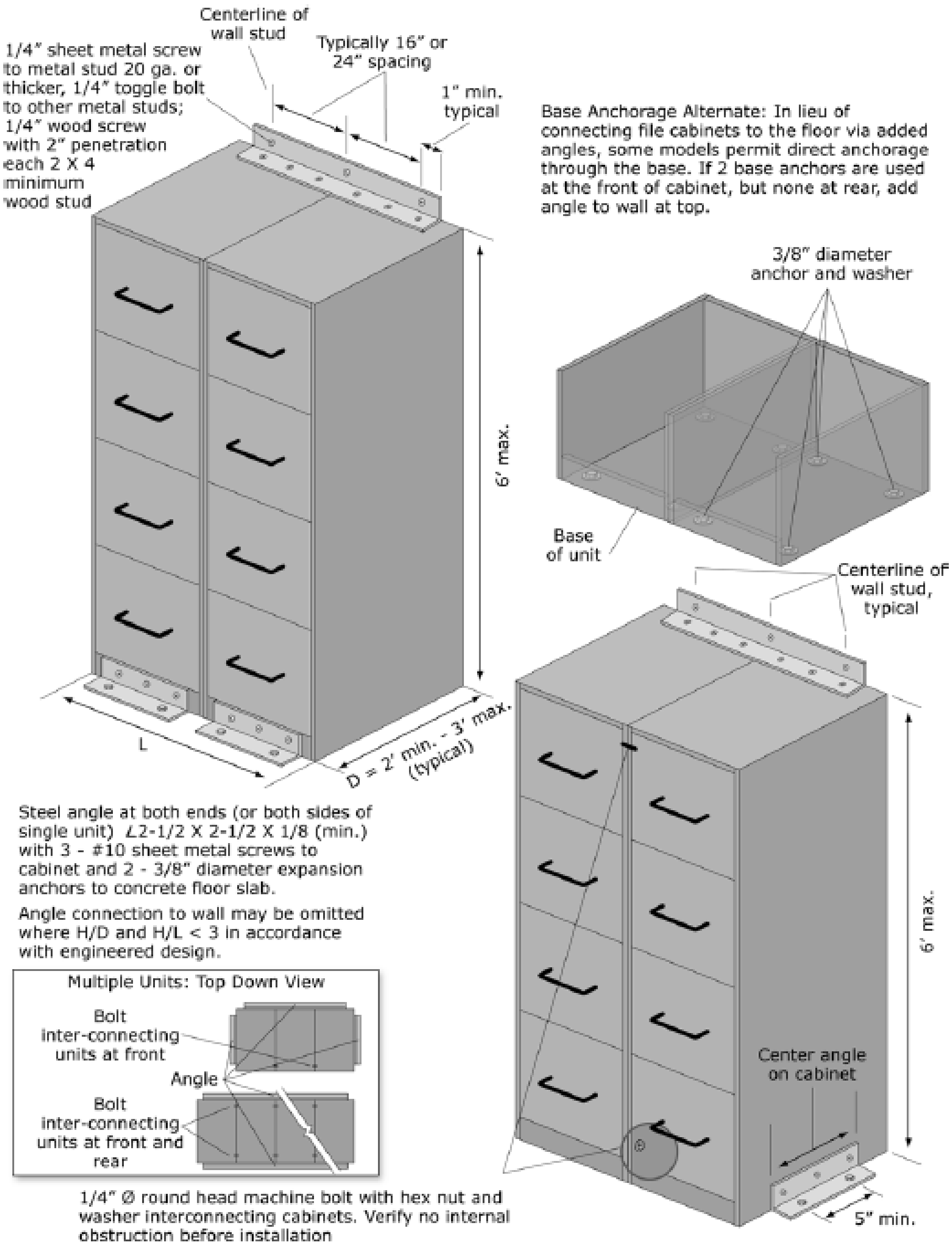


Figure G-21. Wall-mounted File Cabinets.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

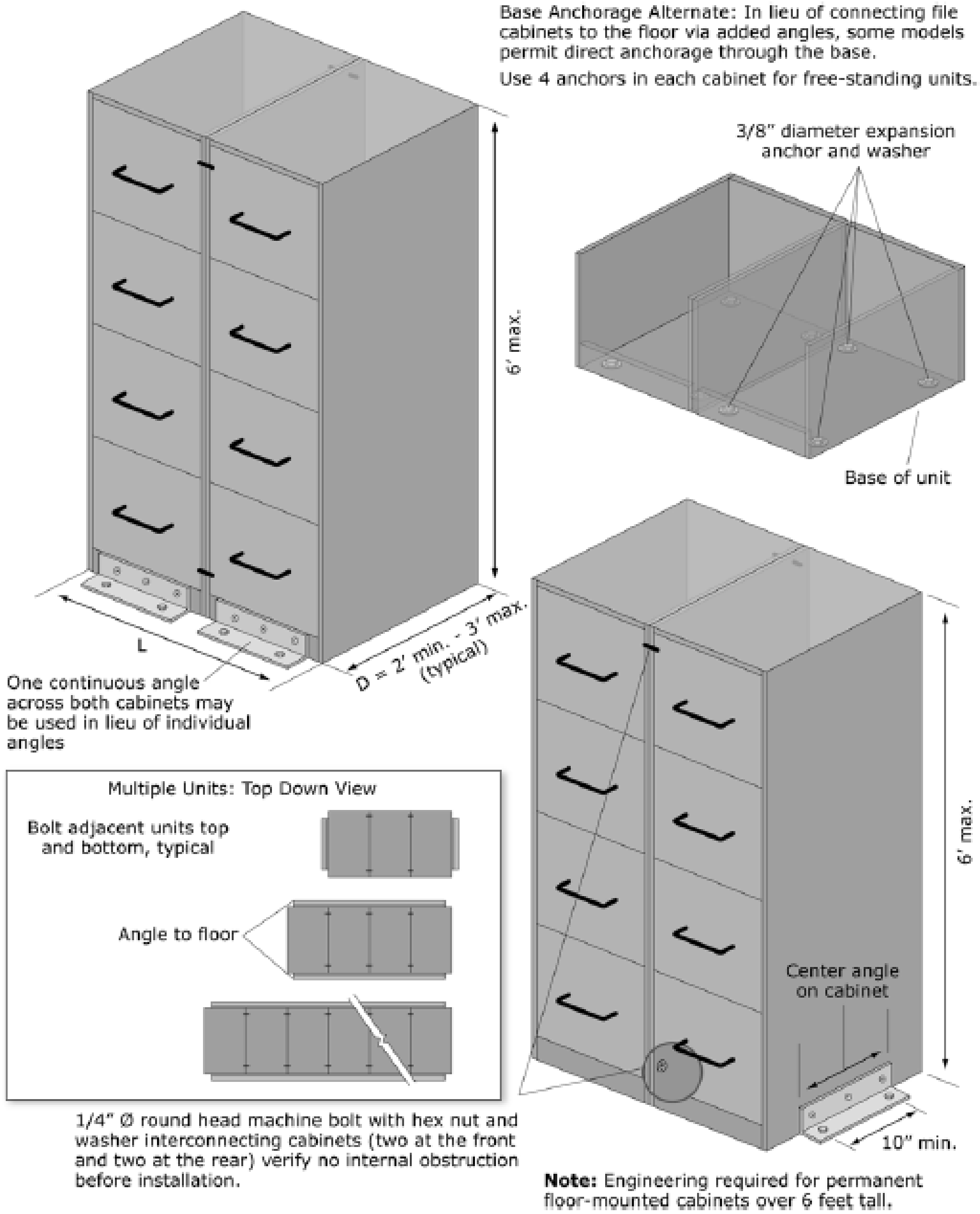


Figure G-22. Base Anchored File Cabinets.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

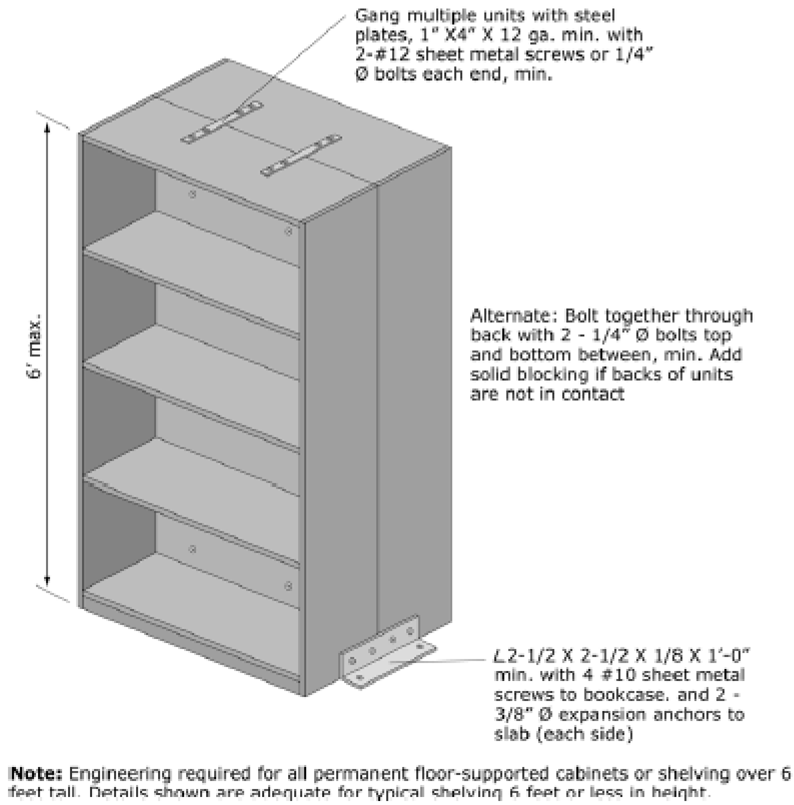


Figure G-23. Anchorage of Freestanding Book Cases Arranged Back to Back.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

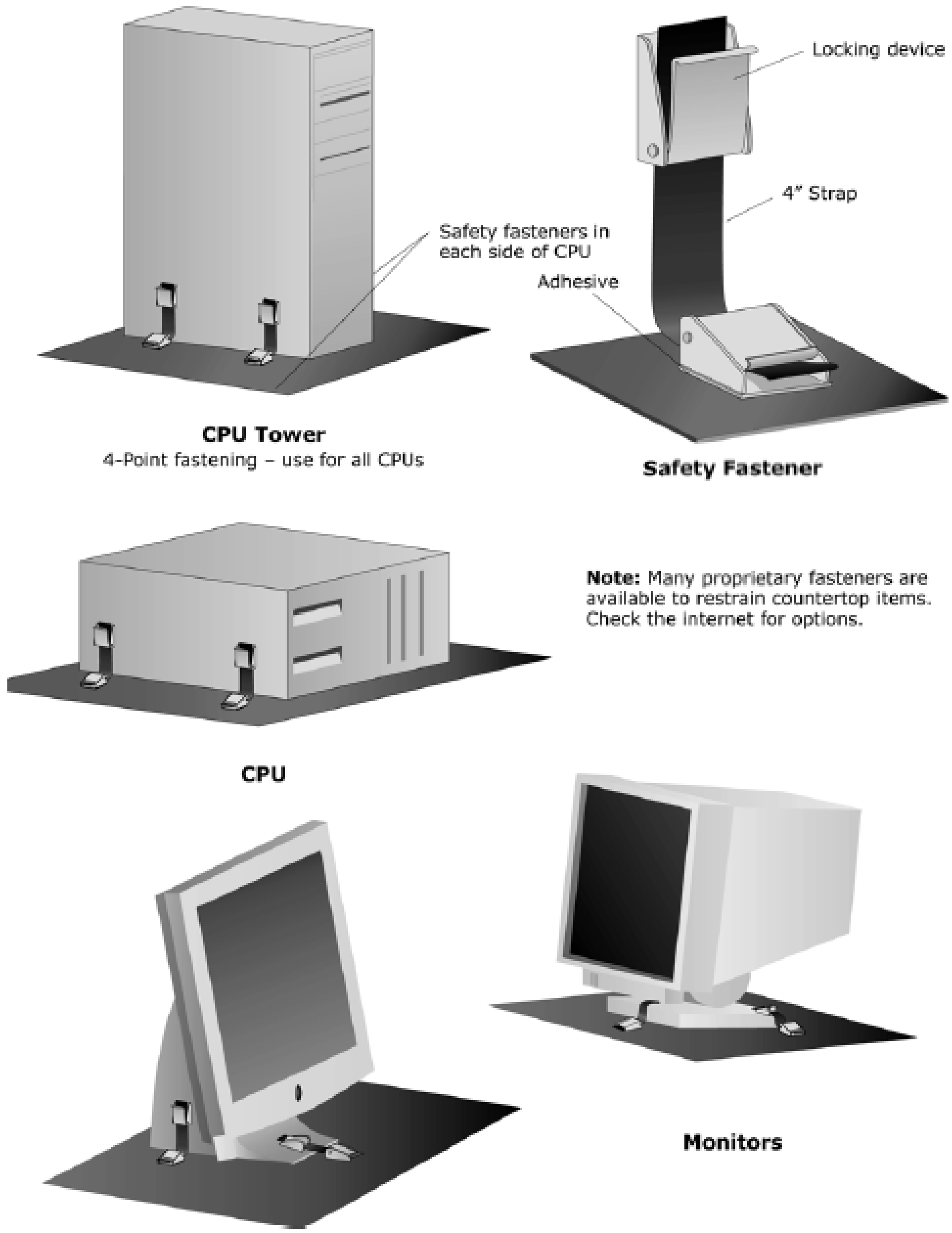
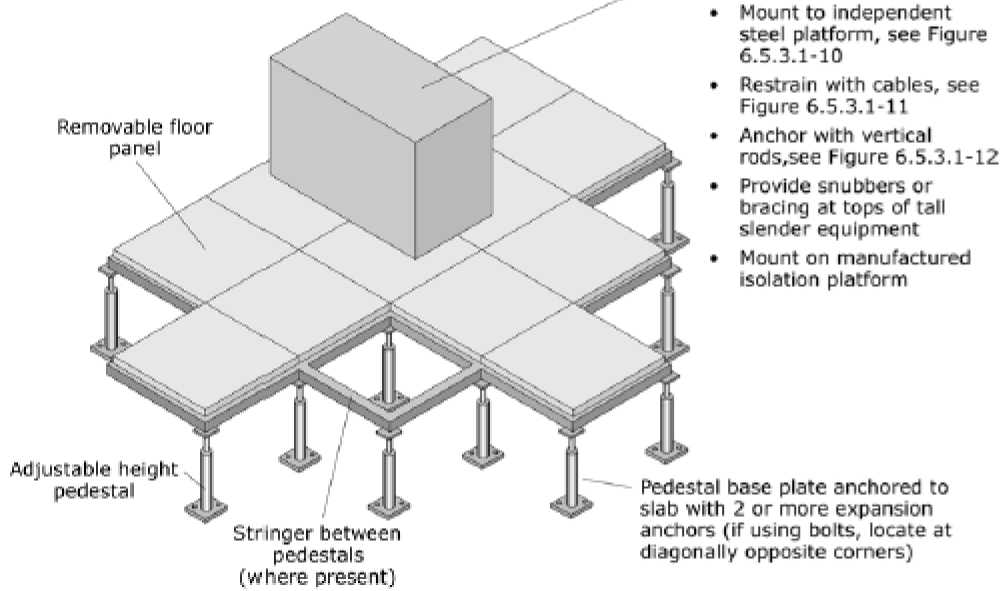
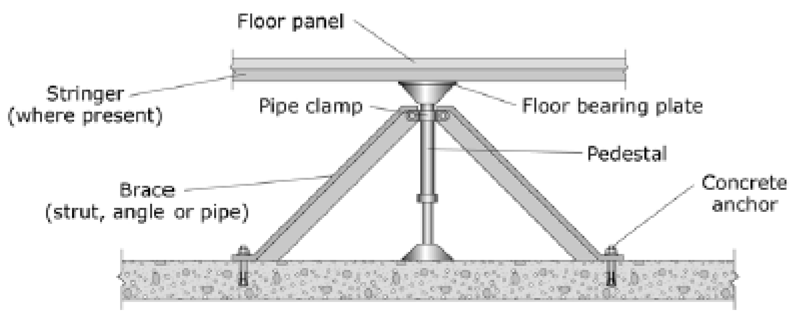


Figure G-24. Desktop Computers and Accessories.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)



Cantilevered Access Floor Pedestal



Braced Access Floor Pedestal
(use for tall floors or where pedestals are not strong enough to resist seismic forces)

Note: For new floors in areas of high seismicity, purchase and install systems that meet the applicable code provisions for "special access floors."

Figure G-25. Equipment Mounted on Access Floor.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

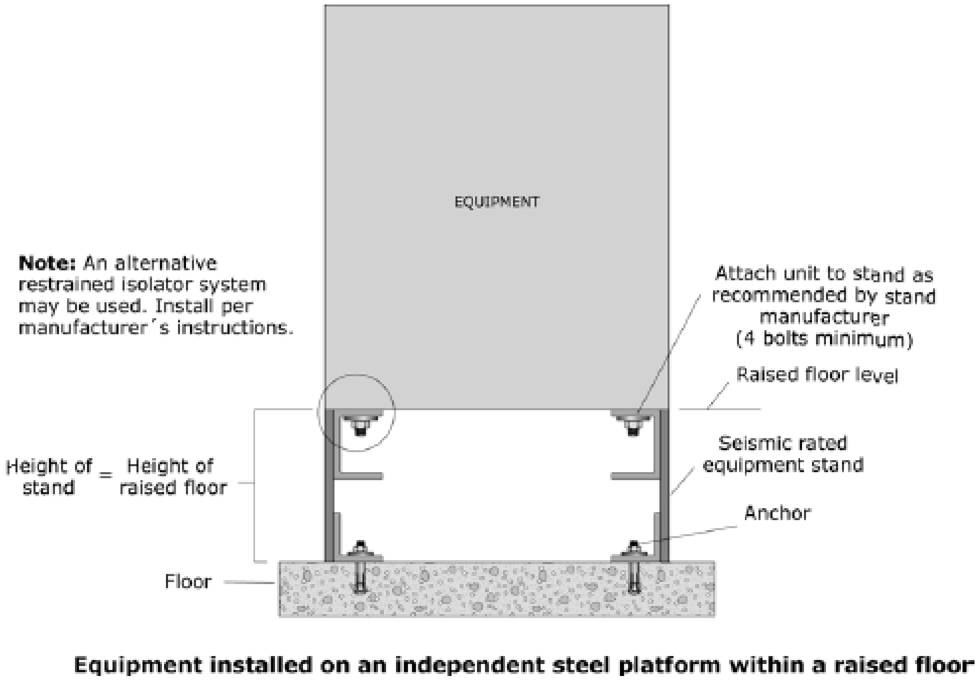


Figure G-26. Equipment Mounted on Access Floor – Independent Base.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

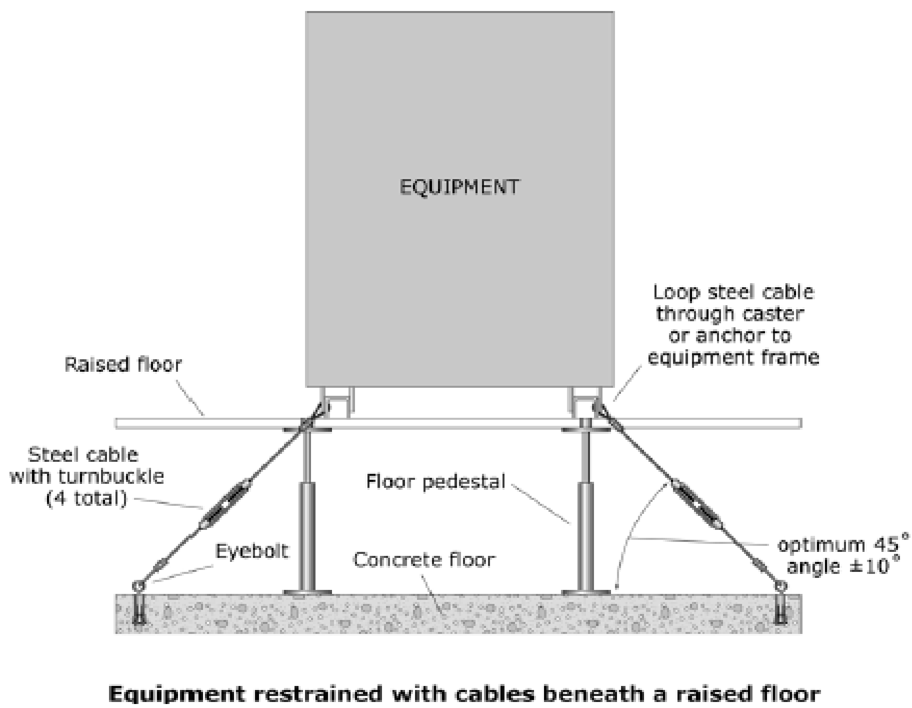
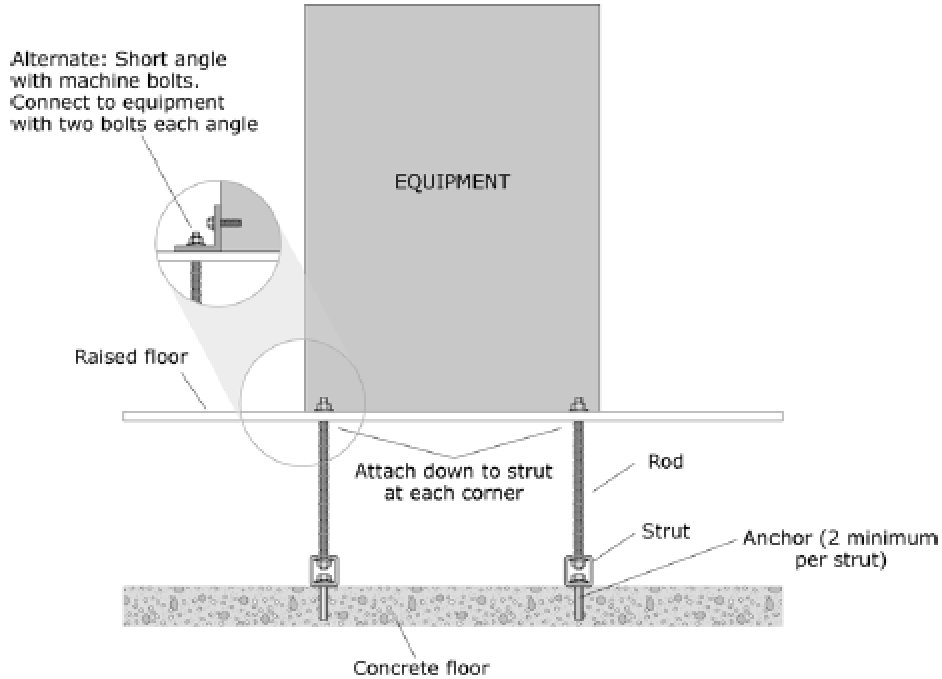


Figure G-27. Equipment Mounted on Access Floor – Cable Braced.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

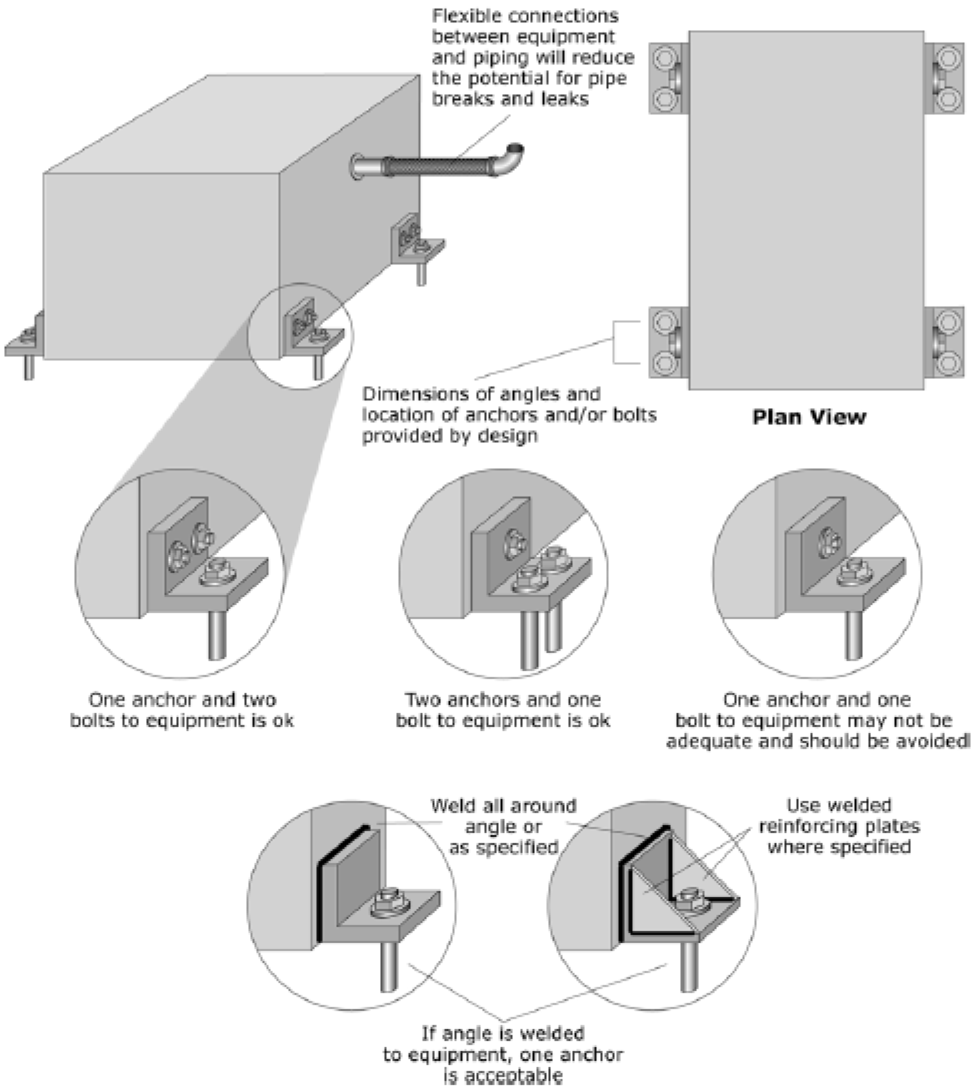


Equipment anchored with vertical rods beneath a raised floor

Figure G-28. Equipment Mounted on Access Floor – Tie-down Rods.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

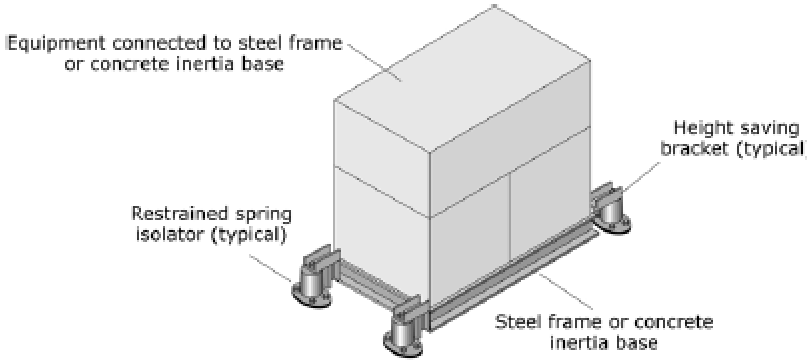
Mechanical and Electrical Equipment



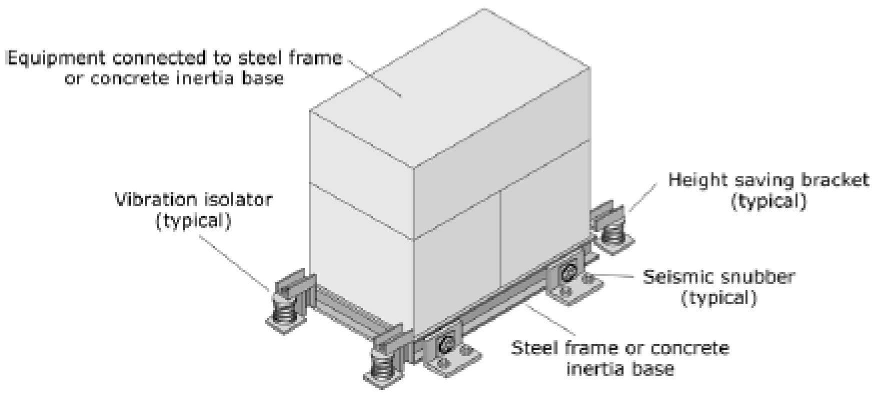
Note: Rigidly mounted equipment shall have flexible connections for the fuel lines and piping.

Figure G-29. Rigidly Floor-mounted Equipment with Added Angles.

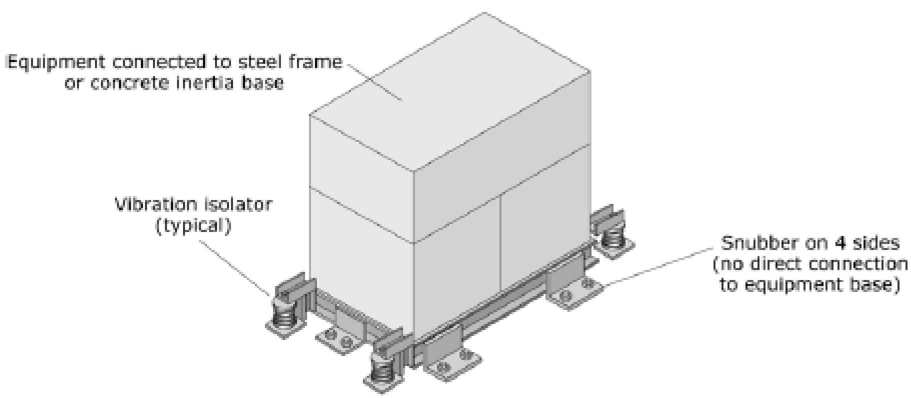
(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)



Supplemental base with restrained spring isolators



Supplemental base with open springs and all-directional snubbers



Supplemental base with open springs and one-directional snubbers

Figure G-30. HVAC Equipment with Vibration Isolation.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

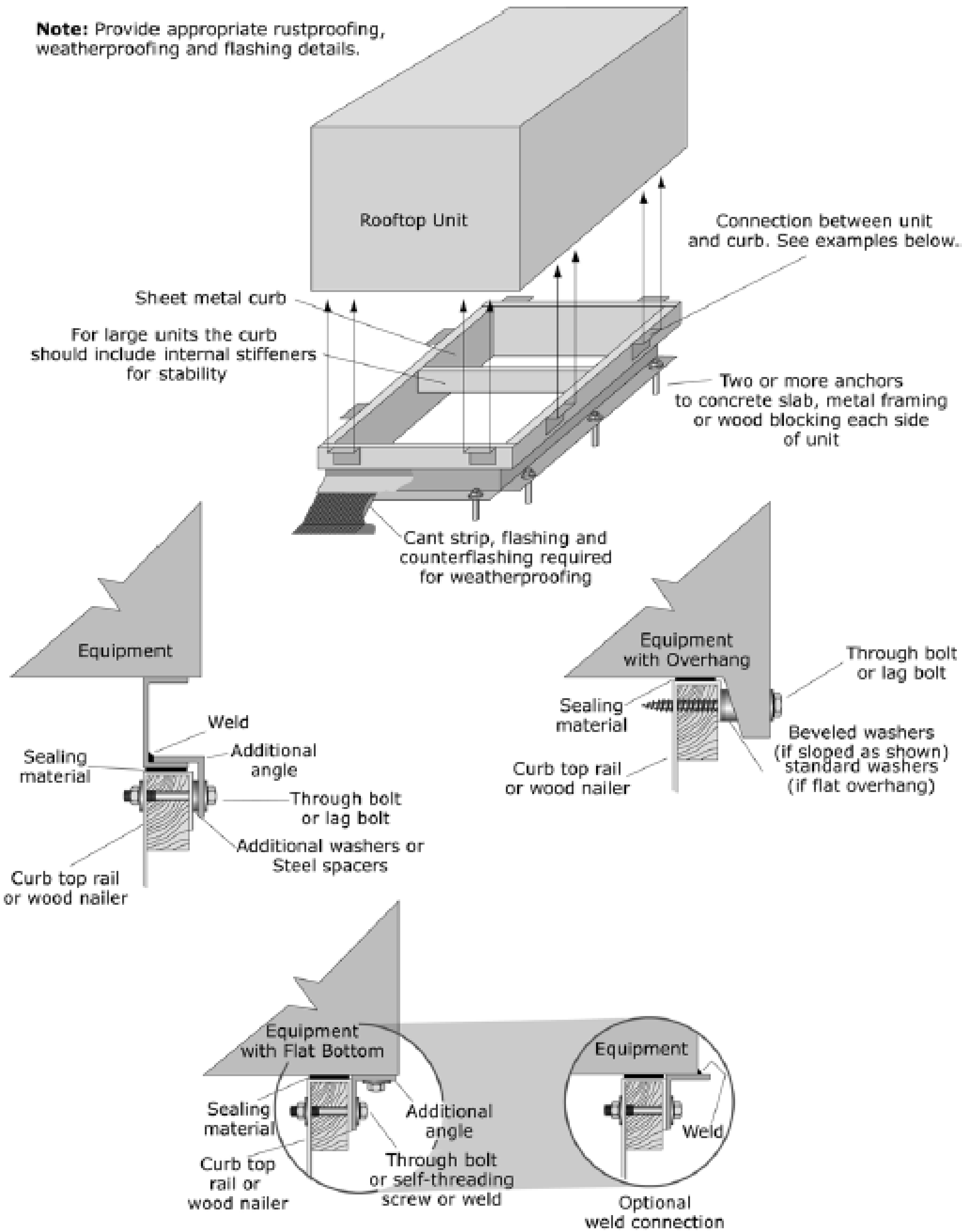


Figure G-31. Rooftop HVAC Equipment.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

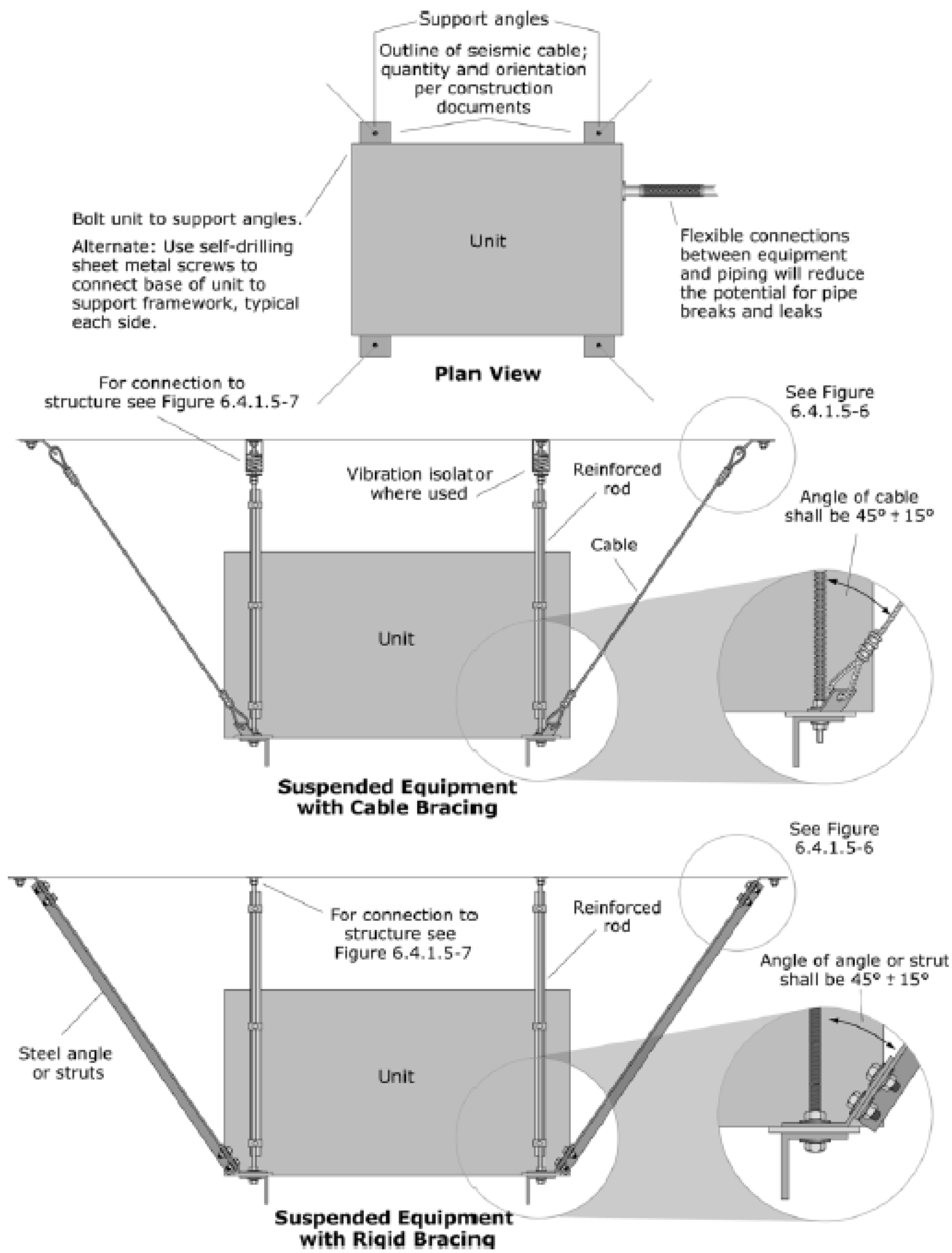


Figure G-32. Suspended Equipment.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

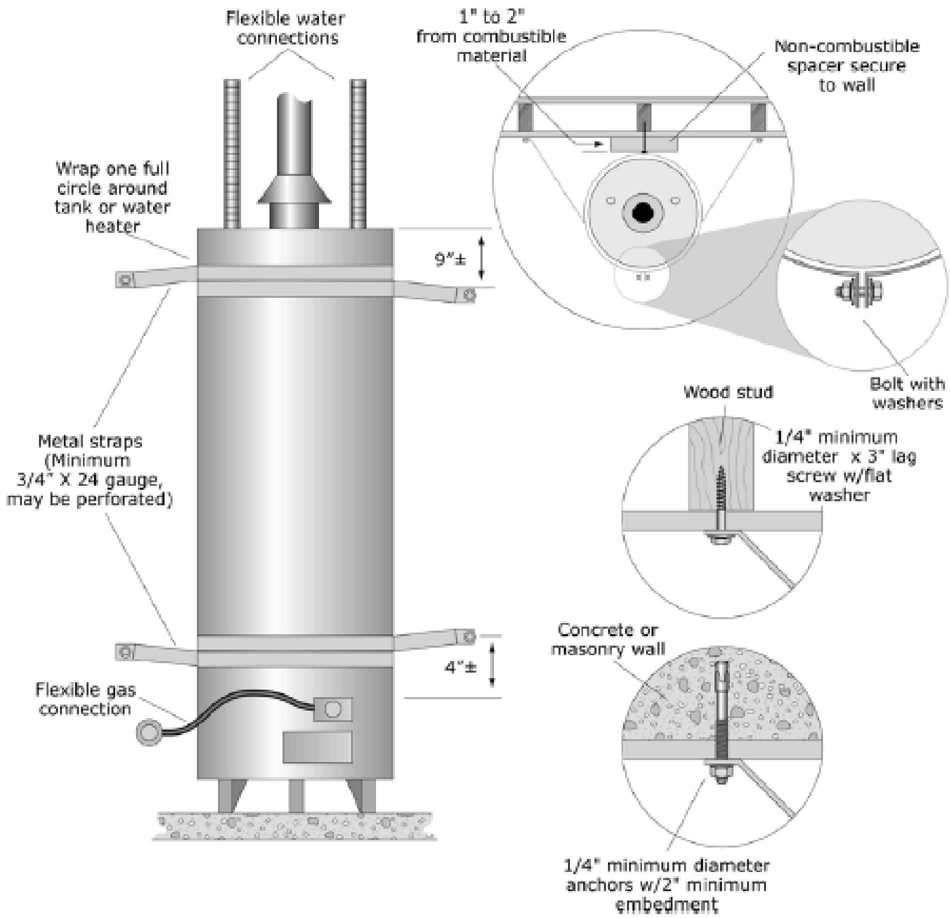


Figure G-33. Water Heater Strapping to Backing Wall.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

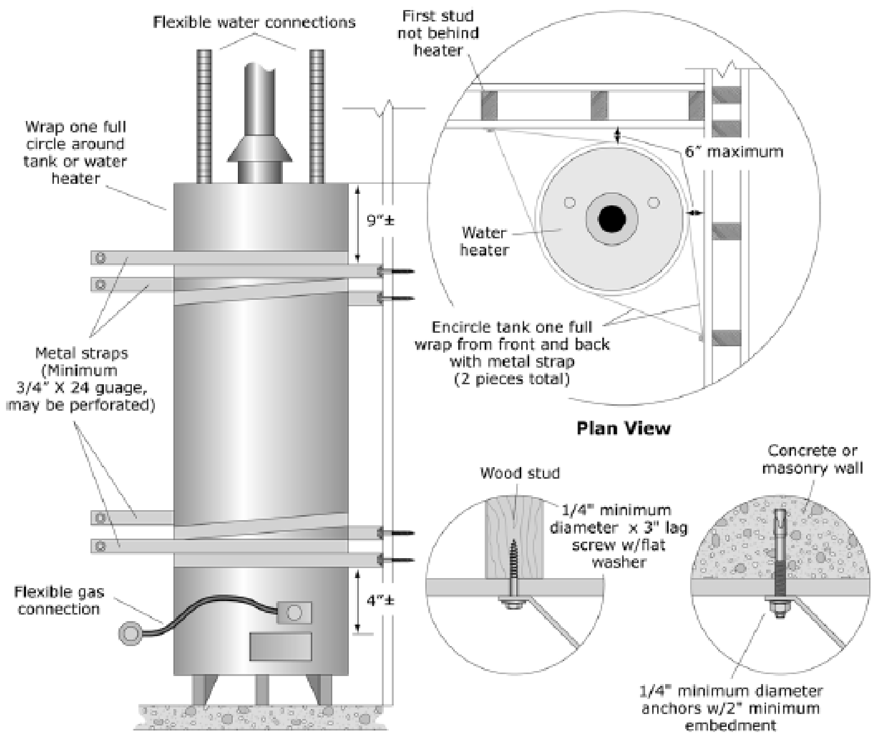


Figure G-34. Water Heater – Strapping at Corner Installation.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

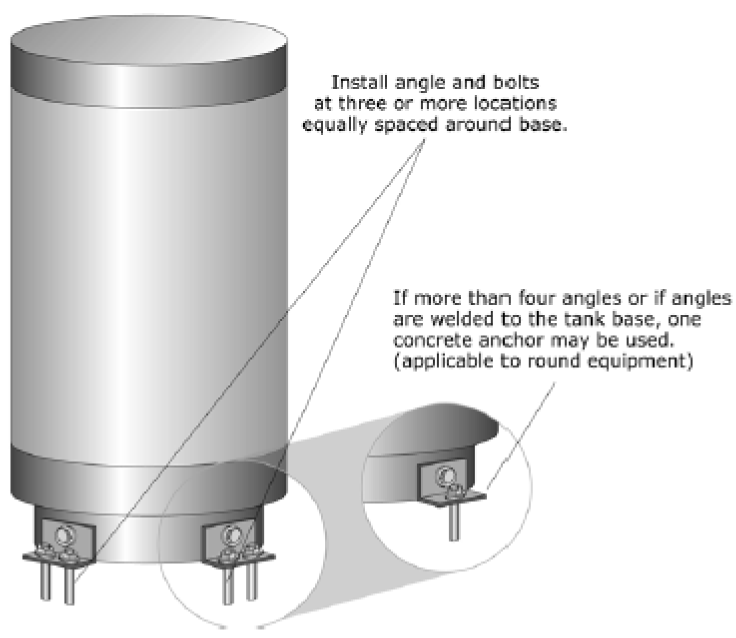


Figure G-35. Water Heater – Base Mounted.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

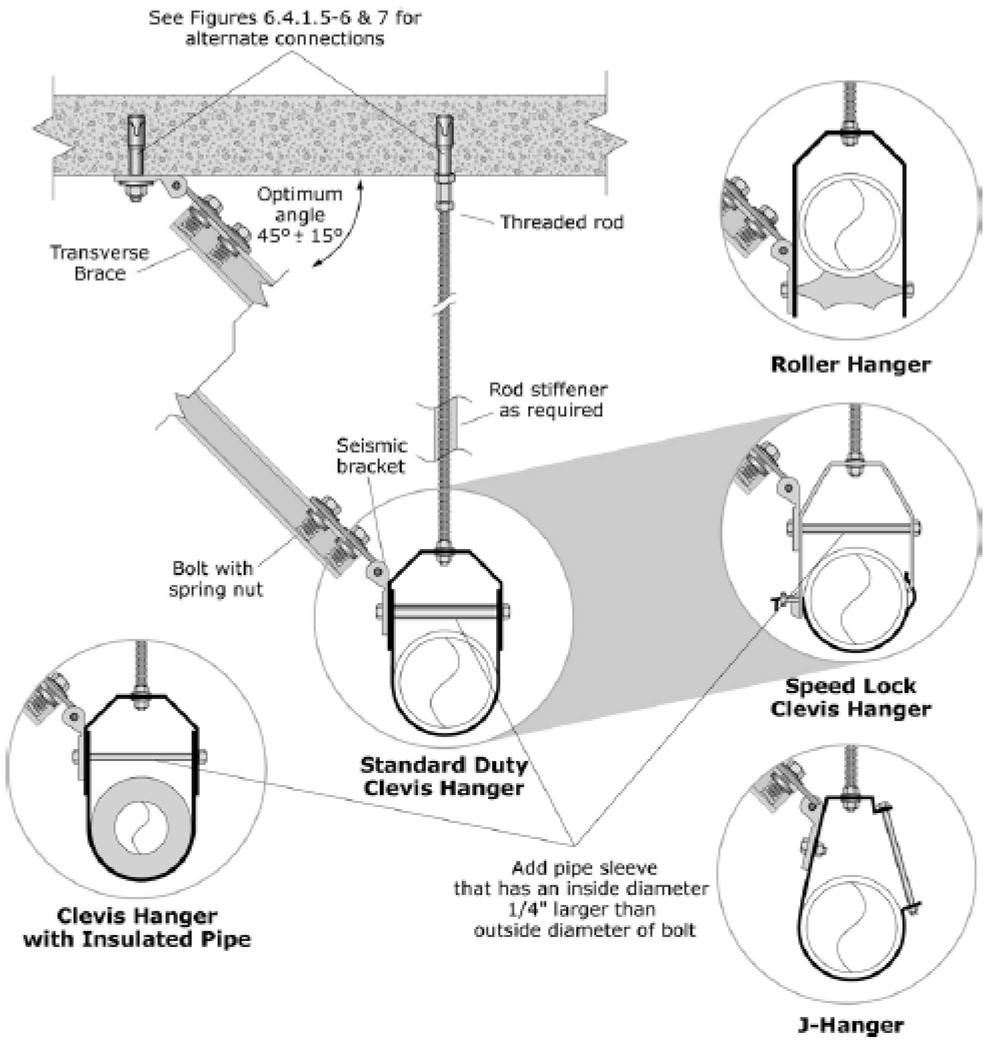


Figure G-36. Rigid Bracing – Single Pipe Transverse.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

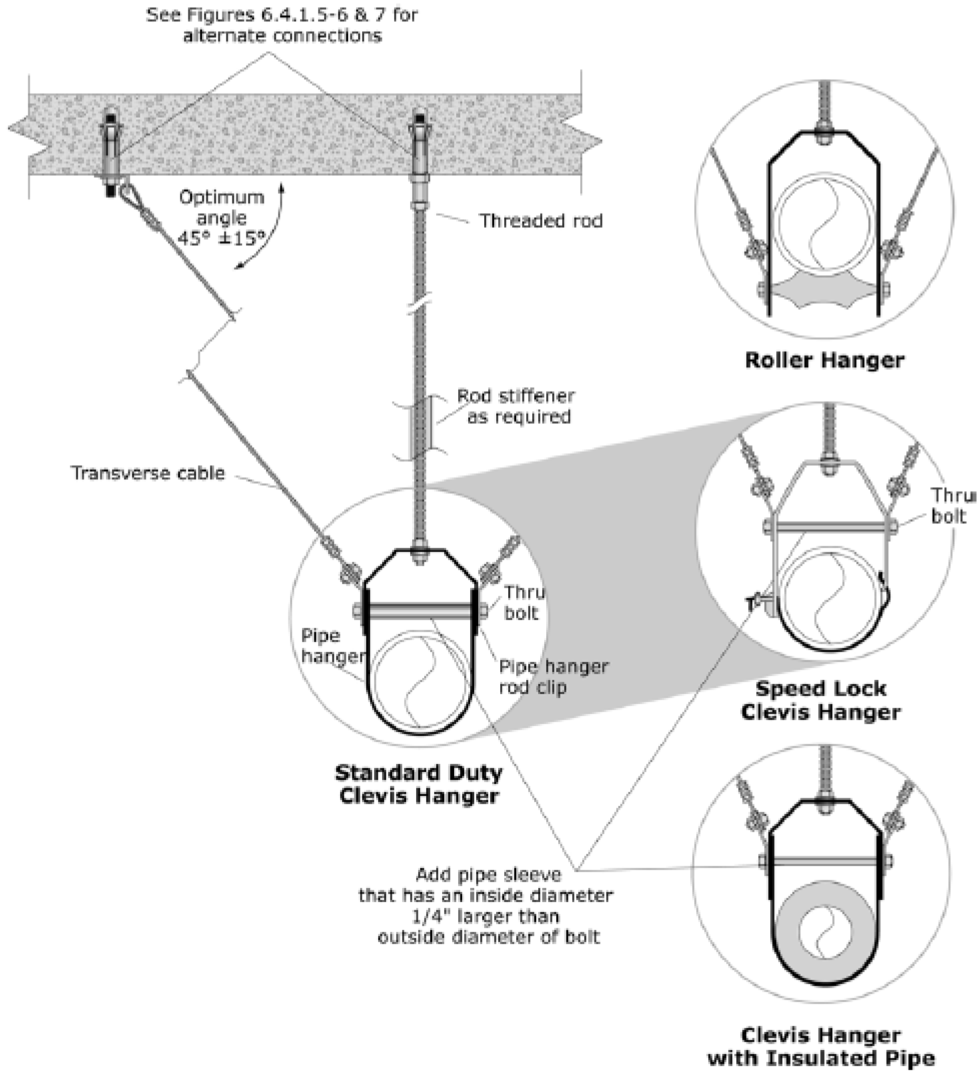


Figure G-37. Cable Bracing – Single Pipe Transverse.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

Electrical and Communications

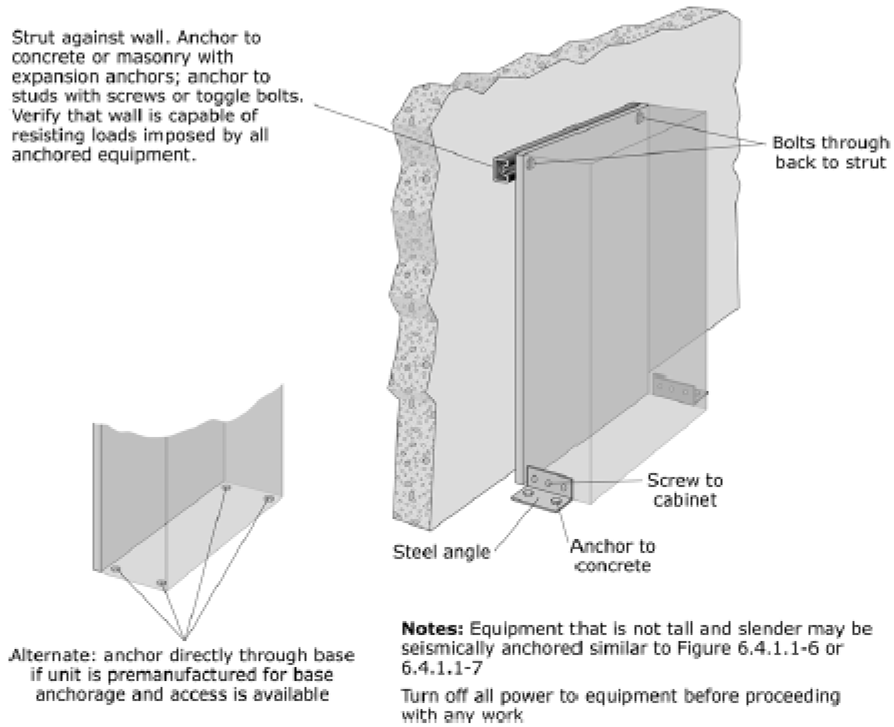


Figure G-38. Electrical Control Panels, Motor Controls Centers, or Switchgear.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

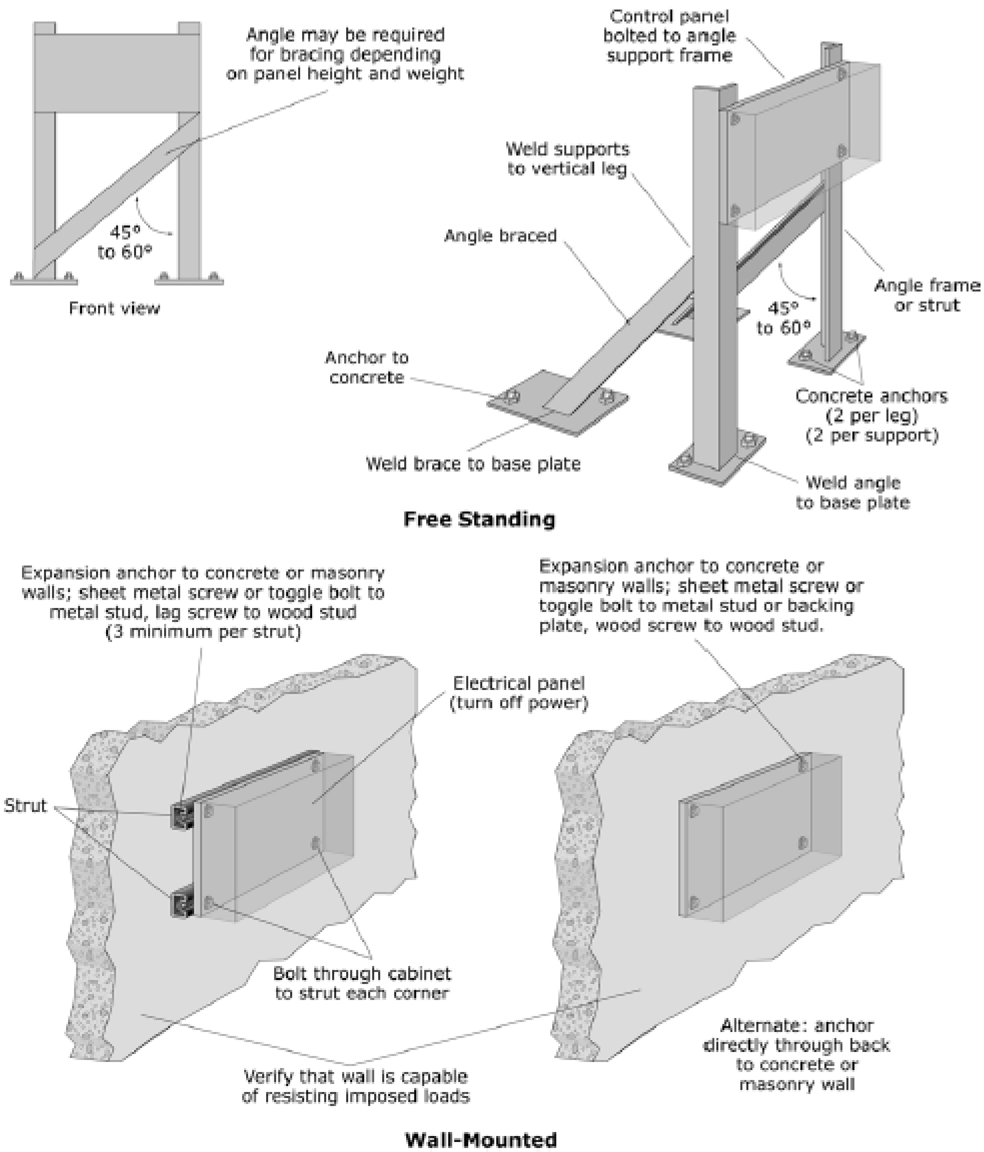


Figure G-39. Freestanding and Wall-mounted Electrical Control Panels, Motor Controls Centers, or Switchgear.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

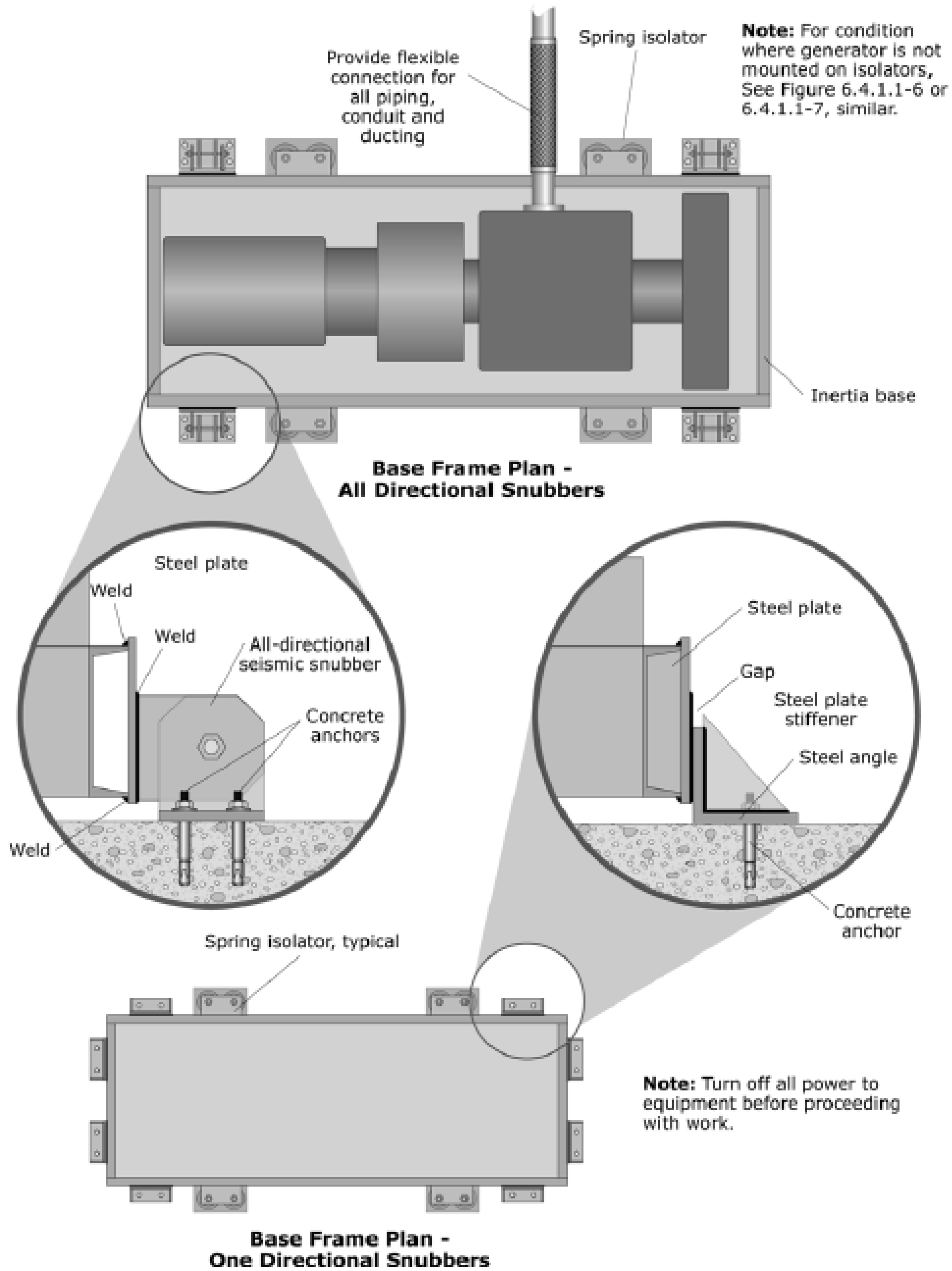


Figure G-40. Emergency Generator.
(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)